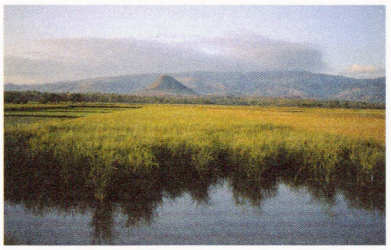
100 Verdae Boulevard (29607-3825)
PO Box 16778 (29606-6778)
Greenville, South Carolina
Telephone (864) 281-0030
Fax (864) 281-0288



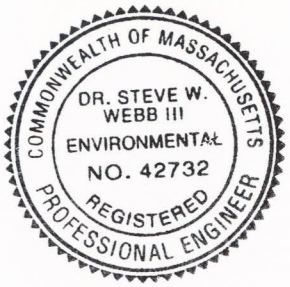
Operations and Maintenance Manual

Light Non-aqueous Phase Liquids Extraction and Groundwater Migration Control System

Columbia Manufacturing Facility
Westfield, Massachusetts

July 2003

Prepared For
MTD Products Inc.



Steven D. Schroeder
Technical Manager

Steve W. Webb, Ph.D., P.E.
Project Manager

Barrett E. Culp
Technical Lead

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Section 1
Introduction

The Columbia Manufacturing Facility (site) is located in Hampden County, Massachusetts, in the City of Westfield. The site consists of a 23.7-acre parcel at One Cycle Street. The location of the site with respect to surrounding features is shown on the site location map provided as Figure 1-1. The site is bounded to the north by residential properties on Cleveland, Lozier, and Toledo Avenues and to the west by a railroad embankment. To the south and east, the site is bordered by agricultural land currently used for the cultivation of shade tobacco.

The Little River borders the eastern and southern edges of the tobacco fields prior to its confluence with the Westfield River approximately ½ mile northeast of the site. The site is situated at an elevation of approximately 140 feet above mean sea level (msl) with topographic relief of approximately 10 feet across the site.

1.1 Background

The facility's production history dates back to the late 1800s and early 1900s. Buildings for production, warehousing, and office use are located on approximately half the site. The majority of the remaining area is paved for parking and/or transportation purposes. The site is fenced with site access controlled through the front office.

Products historically manufactured at the site have consisted of metal tube items including bicycles, mopeds, lawnmowers, motorcycles, munitions (shells only), and school furniture. The primary item manufactured over this tenure was bicycles. Production began in 1897 and continued under various names until 1960. In 1960, the company at the time incorporated and became a division of MTD Products Inc. (MTD) of Cleveland, Ohio. In 1987, Columbia purchased the division from MTD restoring the Columbia Manufacturing name.

Previous investigations indicate that light non-aqueous phase liquid (LNAPL), consisting primarily of highly weathered No. 2 fuel oil, exists on the water table surface beneath the parking area in the northern portion of the facility. Approximately 0.05 to 0.15 foot of LNAPL exists in a 20,000-square foot area north of the existing facility building. In addition, residual fuel oil has been encountered in the unsaturated soil or "smear zone" above the water table. An LNAPL removal system has been designed to address both free-phase liquids at the water table as well as the LNAPL residuals adsorbed to the overlying soil.

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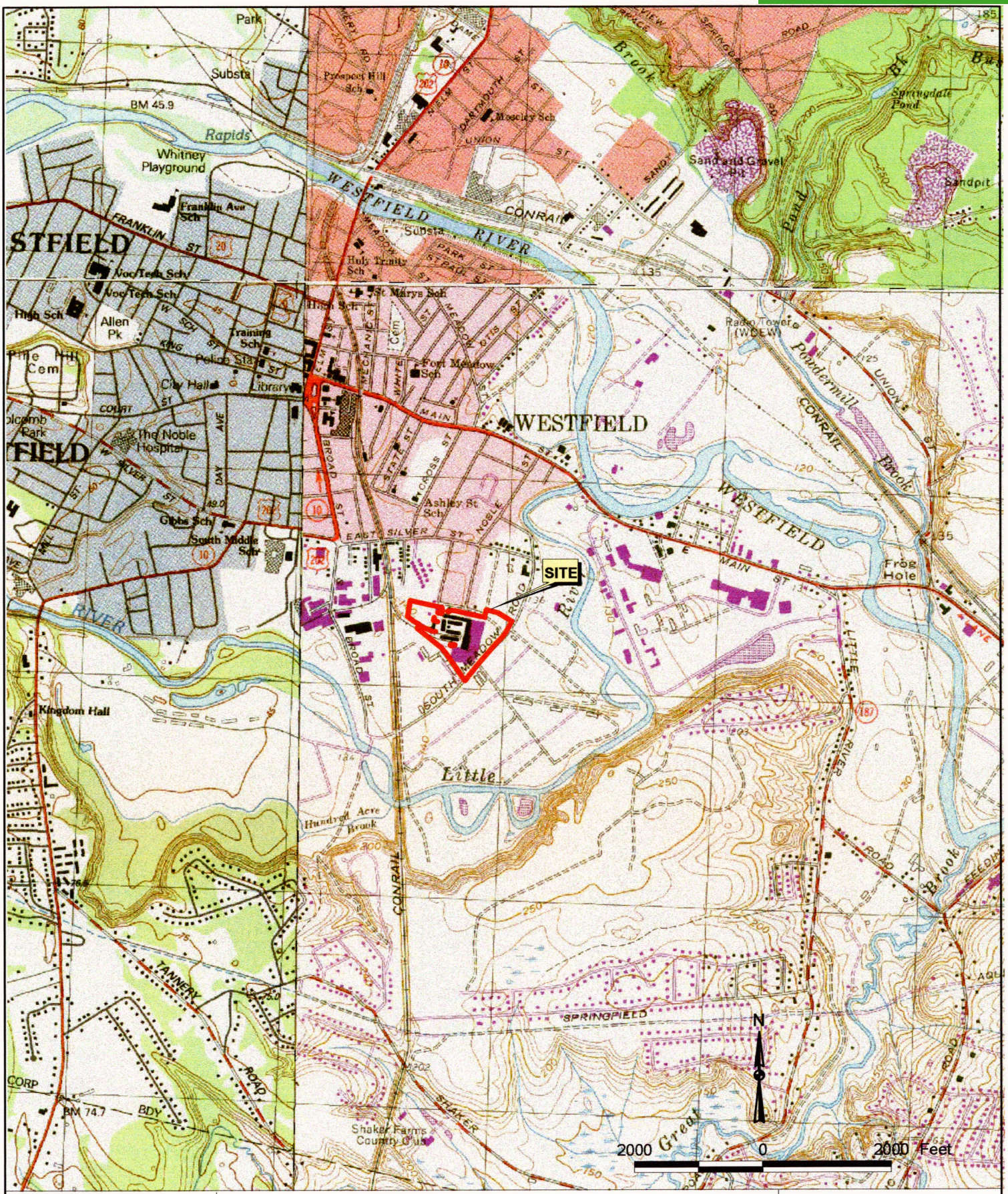

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Columbia Manufacturing, Inc

Figure 1-1
Site Location Map

Drawn By:	MAG
Approved By:	SWW
Project No.	998.81
File No.	SITELOCATION998_81
Date:	May 2003

Hydrogeological investigation results indicate that a chlorinated volatile organic compound (VOC) plume is present in on-site and off-site areas along the northern portion of the facility. A groundwater recovery system has been designed to address the migration of this VOC-affected groundwater to off-site areas.

1.2 Purpose of Plan

The purpose of this plan is to summarize and document the operation and maintenance (O&M) tasks required to effectively operate the remedial action system installed in the northern portion of the plant site. This document also provides information concerning health and safety, routine monitoring, and troubleshooting activities. In addition, the plan provides information regarding O&M responsibilities, details about design considerations, vendor-supplied O&M manuals, and specifications for the plant site. This document contains the technical basis for site O&M activities as they relate to startup, shutdown, and maintenance of the LNAPL extraction and groundwater migration control system.

Section 2
Groundwater Migration Control System Description

Groundwater extraction is a proven and effective method of intercepting groundwater flow and controlling the migration of constituents in groundwater. A submersible pumping system is installed in a recovery well or trench system to withdraw groundwater. The groundwater pumping action creates a cone of depression, resulting in preferential flow of groundwater into the recovery system. In design, the location of the withdrawal components (well or trenches) and the design pumping rates are selected so that a hydraulic barrier is created to control constituent migration. The recovered groundwater is generally disposed of by transferring untreated or pretreated water to an off-site treatment facility, treatment and surface water discharge, or treatment and re-infiltration into the aquifer.

Groundwater recovery has been selected as the preferred technology for interim measures migration control of chlorinated VOCs in groundwater because

- it is a proven means for effective migration control;
- site conditions (hydraulic conductivity, aquifer thickness) are amenable to the technology; and
- remedial equipment is readily available for deployment as an interim action.

The proposed system layout for the groundwater migration control system, system design plans, and installation specifications are included in Appendix A. A groundwater recovery well schematic is provided as Figure 2-1. Major system components are summarized in Table 2-1. The following subsections describe the various system components and their functions.

2.1 Groundwater Recovery Wells (RW-01 through RW-07)

Seven groundwater recovery wells (RW-01 through RW-07) have been installed adjacent to the facility's northern property boundary to control groundwater migration off the site. Using this system, groundwater along the property boundary is intercepted, and the capture zones extend off the site to the north of the property. Appendix A includes design drawings that show the specific locations of the recovery wells.

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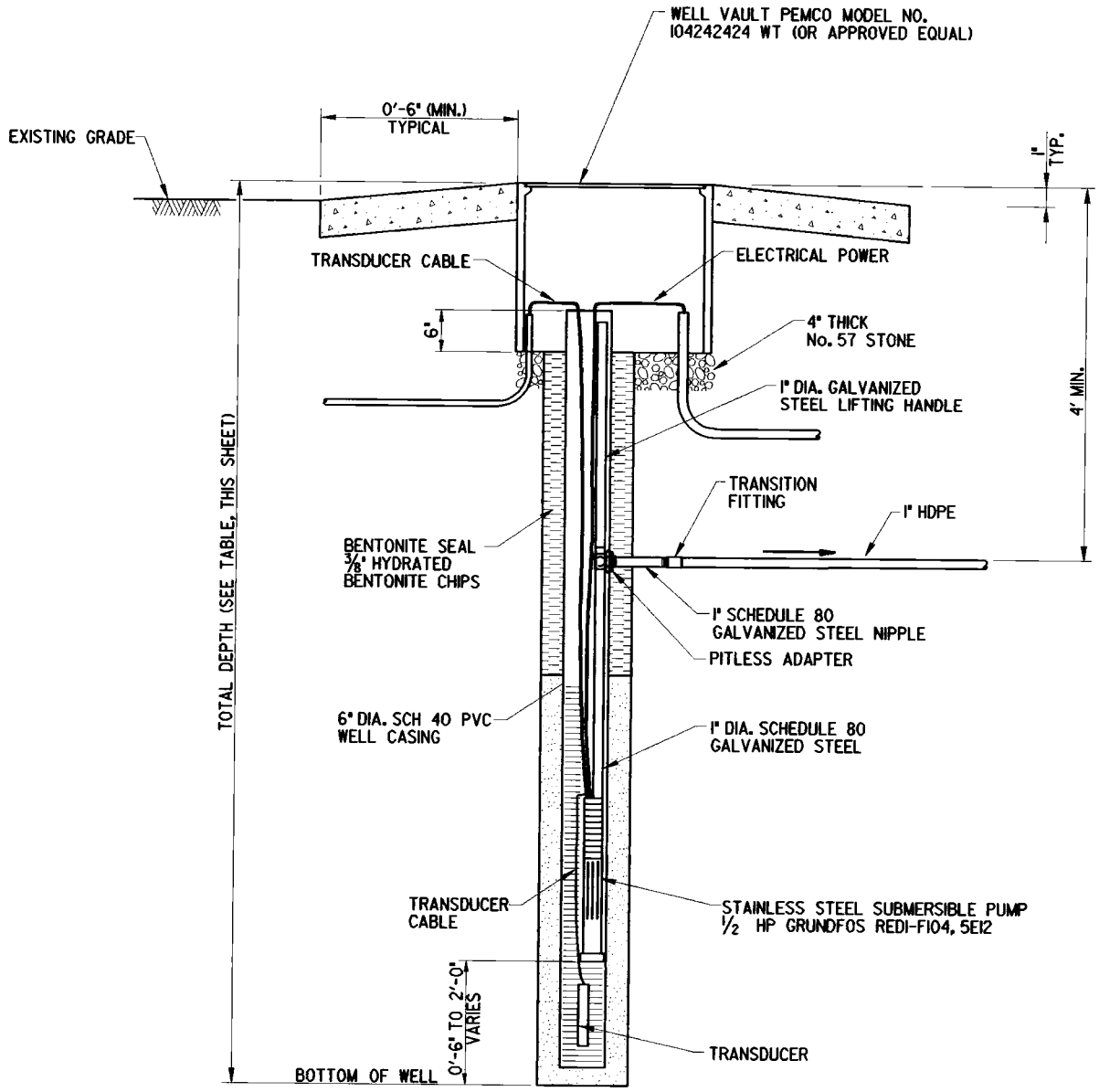

RMT INC.

MTD PRODUCTS COLUMBIA MANUFACTURING FACILITY WESTFIELD, MASSACHUSETTS	DRAWN BY: AHS APPROVED BY: BEC PROJECT NO. 998.81 FILE NO. DTG-90.998.66-002-1.DGN DATE: JULY 2003
GROUND WATER RECOVERY WELL SCHEMATIC	

FIGURE 2-1

Table 2-1
Major System Components for the Groundwater Migration Control System

ITEM	EQUIPMENT NAME	VOLUME OR CAPACITY	MANUFACTURER	MODEL NO.	MATERIAL(S) OF CONSTRUCTION	HP
P-101/ 102/103/ 104/105/ 106/107	Recovery well pumps	1.2 to 7 gpm	Grundfos	5E12	Stainless steel	1/2
PT-101/ 102/103/ 104/105/ 106/107	Pressure transducers	0 to 30 psig	INW	PS98i	Stainless steel	
PI-101/ 102/103/ 104/105/ 106/107	Pressure gauges	0 to 60 psi		4053KI	2½" liquid-filled 304 stainless steel	
PI-201/ 202	Pressure gauges	0 to 60 psi		4053KI	2½" liquid-filled 304 stainless steel	
FQIT-101/ 102/103/ 104/105/ 106/107	Nutating disc flow meters	1 to 25 gpm	Badger Meter, Inc.	M25	$^5/_8$" bronze	
FQIT-201/ FQI-201	Magnetic flow meter	0.25 to 80 gpm	Endress + Hauser	Proline Promag 50	2"	

Table 2-1
Major System Components for the Groundwater Migration Control System

ITEM	EQUIPMENT NAME	VOLUME OR CAPACITY	MANUFACTURER	MODEL NO.	MATERIAL(S) OF CONSTRUCTION	HP
FQIT-202	Cold water Recordall® Turbo 450 Meter	5 to 550 gpm	Badger Meter, Inc.	450 Turbo	Cast bronze, 316 stainless steel, thermoplastic, ceramic, sapphire jewels	
S-201	Bag filter vessel with 100-micron bag filter	50 gpm	Rosedale	Vessel: 4-12-2P-2-500-CBNB Filter: PE-100-P-4	Vessel: Filter: polyester felt	
	Carbon filter (liquid phase)	12 gpm	Service Tech, Inc.	Liquidclean HP200	Polyglass	
LIT-201	Ultrasonic level transmitter for water storage tanks		Millitronics	Multiranger 100		
P-201	Centrifugal discharge pump for water storage tanks	300 gpm @ 20 feet TDH	Gusher	3x4x8B-SEH-CC-ACI		5
	Water storage tanks	13,600 to 15,500 gallons	Mass Tank	N/A	Carbon steel	
	Carbon filter (vapor phase)	0 to 175 cfm	Tetrasolv	VFD-30	Carbon steel	
LSHH	High-high level switch for storage tanks		Dwyer Instruments, Inc	L4	Brass/316 stainless steel	

Recovery well placement is based on the results of previous hydrogeologic assessments and groundwater modeling. Groundwater modeling was conducted specifically to delineate capture zones and estimate groundwater flow rates for achieving migration control along the northern site property boundary. Six, seven, and eight well scenarios were modeled, under variable rates of recovery, to select an optimal system for migration control. From these evaluations, a seven well recovery system was selected for implementation. Total recovery rates from this system are estimated at between 11 gallons per minute (gpm) and 17 gpm.

The recovery wells are constructed of 6-inch nominal, flush joint Schedule-80 polyvinyl chloride (PVC). The wells are installed at an average depth of approximately 25 feet below land surface (bls), such that the total depth of the recovery wells is 2 to 3 feet below the top of the lacustrine unit. Recovery well construction details are provided in Appendix A. Each well is constructed with a 10-foot section of 0.010-inch, factory-slotted well screen installed from the base of the well. Recovery wells are completed with a 24-inch by 24-inch watertight well vault, fitted with a lockable access door.

2.2 Grundfos® Submersible Pumps (P-101 through P-107)

A 208-volt, 3-phase Grundfos® Redi-Flo4 submersible pump (½ hp) is installed in each recovery well. Each pump is sized to provide the required flow rate (obtained from modeling results) at the estimated total design head for each location. The rate of groundwater discharge for each well pump is controlled by individual variable speed drive (VSD) units assigned to each pump motor. The VSD adjusts the speed of the motor (*i.e.,* the rate of discharge) based on water level data at the well. Water level data are continuously gathered using in-well pressure transducers at each well. System pumping controls are designed such that pumping rates are automatically adjusted until targeted water levels at each of the recovery wells are achieved.

Each groundwater pump is controlled from the main control panel using an illuminated ON-OFF-AUTO selector switch. In the ON mode, each pump operates continuously regardless of water level conditions within the well or operating conditions of any other system component. When operated in the ON mode, the VSDs can be manually adjusted from 0 to 100 percent at the main control panel. In the AUTO mode, the well pump controlled by the selector switch operates only if water level within the well is above a designated low-level condition (and other conditional interlocks, as outlined below, are met). This low-level condition is measured with a submersible pressure transducer/transmitter. In the OFF mode, the well pumps will not operate. The selector switch for each pump will illuminate only when the pump is operating.

2.3 Groundwater Recovery Pipelines

In-well piping from each submersible pump to the well head is Schedule 40 carbon steel pipe. A pitless adapter is used to connect the well pipe to 1-inch diameter high-density polyethylene (HDPE) water pipe. The HDPE piping along with electrical wiring for the well pumps is installed in below grade trenches and routed back to the storage tank building. All buried water conveyance piping is installed to a depth of 4 feet below grade. This depth was chosen based on regional frost line conditions.

The conveyance pipelines for the recovery wells are outfitted with control valves and flow and pressure meters within the storage tank building. All valves and meters within the piping system and wells are rated at a minimum of 150 pounds per square inch (psi). A check valve is installed in each submersible pump to prevent recovered groundwater from flowing back into the aquifer. An additional check valve is also located immediately before the flow meter within the storage tank building.

2.4 Groundwater Filtration

The individual well pipelines converge at a manifold within the storage tank building and then route through a bag filter for removal of suspended solids from the recovered groundwater. It is anticipated that after initial startup and operation, the filter system may be bypassed, if the sand pack around each of the recovery wells provides adequate solids filtering. The filter consists of a single filter housing equipped with a 100-micron filter bag and bypass valving and piping. Alternate filter pore sizes may be utilized, if required.

After filtration, groundwater is routed through two activated carbon drums operated in-series to ensure that recovered groundwater meets the requirements of a RCRA nonhazardous waste prior to storage and subsequent disposal at the City of Westfield Water Pollution Control Plant (WPCP).

2.5 Groundwater Storage and Disposal

Extracted groundwater from the seven groundwater recovery wells along with groundwater that has been collected and separated through the dual-phase vacuum extraction (DPE) system (see Section 6) is routed and stored in two aboveground storage tanks. The storage tanks are constructed of carbon steel and have maximum capacities of 13,600 and 15,500 gallons. The storage tanks are the same height, and both storage tanks are hydraulically-connected with influent and effluent piping, so that both storage tanks fill simultaneously and the storage volume is maximized. A totalizing water meter is installed immediately after the solids filter unit to measure cumulative water volume routed to the storage tanks. The storage tanks contain an ultrasonic level controller that is interlocked with the recovery well pumps and the

DPE system, such that recovery well pumps and the DPE system will be automatically turned off if water level in the storage tanks exceeds a preset high storage tank level.

Water collected in the storage tanks will be periodically pumped into tanker trucks by a water transfer pump (centrifugal pump P-201) and transferred for off-site disposal. The pump is manually operated to transfer groundwater from the storage tanks via PVC pipe and hose to water-hauling tanker trucks. The main control panel is equipped with an illuminated HAND-OFF-AUTO selector switch for this pump.

This pump is also controlled with an auxiliary control panel located in the immediate vicinity of the transfer pump. This auxiliary control panel is equipped with an ON-OFF switch that only allows operation of the pump if the switch is placed in the ON mode. The auxiliary control panel is also equipped with illuminated START-ON and STOP-OFF push buttons. The STOP-OFF push button will be illuminated red whenever the pump is de-energized (or when the switch is in the OFF position). The START-ON button must be pressed to start the pump and will illuminate green when the pump is ON.

Water transfer pump operations will be automatically stopped based on a pre-set transfer volume limit as set and measured by the flow metering system installed on the tank discharge line. The transfer pump will also automatically stop when a low-low level alarm condition is experienced in the storage tanks. This prevents air from entering the transfer pump, thereby minimizing pump cavitation and potential pump damage. The resetable flow meter/totalizer display is mounted in the auxiliary control panel. When transfer of water to tanker trucks has been completed, the ENABLE switch should be manually turned to the OFF position. The truck end of the discharge hose should be disengaged, and the water remaining in the hose should be emptied into a 7-gallon bucket which functions as a sump. If the bucket is full, the sump pump must be plugged in to transfer water from the bucket to the storage tanks. The flow meter/totalizer must be reset prior to the next transfer. The flow meter totalizer should be checked to ensure that it has been reset prior to initiating water transfer.

Water from the groundwater recovery system will be trucked and disposed of at the City of Westfield's wastewater treatment plant. Recovered groundwater from the storage tanks will be tested on a monthly basis in accordance with the site's industrial discharge permit.

Section 3
Operation of Groundwater Migration Control System

The groundwater migration control system is designed for automated operation. The operator is responsible for routine daily inspections, maintenance, compliance monitoring, and troubleshooting in the event of a system failure or diminished treatment performance.

The following subsections describe the tasks required of initial startup, normal operation, normal shutdown, emergency shutdown, troubleshooting, and alternate operation.

3.1 Initial Startup

Note:

The initial startup of the system requires the operator to verify that each system component is prepared for operation. This step-by-step check is necessary to protect process equipment and to ensure compliance with environmental operating permits.

It is important to assess LNAPL capture prior to initiating operation of the groundwater migration control system to guard against the potential for LNAPL to enter the groundwater migration control system. Therefore, the following general start-up sequence will be used:

- Test/start-up the DPE system (see Section 7)
- Assess LNAPL and groundwater capture, especially in the vicinity of RW-1 and RW-2.
- Bring the groundwater migration control system on line while manually controlling flow rates at low values, notably at recovery wells RW-1 and RW-2. Assess groundwater capture zones with both the DPE and the groundwater migration control systems in operation, focusing on capture zones between the area where LNAPL is present and recovery wells RW-1 and RW-2.
- Adjust groundwater flow rates, as appropriate, and continue assessing capture zones in the area of the LNAPL footprint to establish initial operating flows that protect against the LNAPL entering the groundwater migration control system.

Note: Recovery wells RW-1 and RW-2 may be excluded from initial operations, if necessary, to ensure that LNAPL will not be drawn into the groundwater system.

To initiate operation of the groundwater migration control system, the system operator must do the following:

1. Ensure that building heaters are fully functional to prevent freezing of recovered liquids. The thermostat should be set to a minimum of 50ºF during freezing conditions and to 80ºF to activate the vent fan during hot ambient temperature conditions.
2. Inspect all system valves and verify proper orientation for normal system operations.
3. Place the HAND-OFF-AUTO switch for RW-1 in the AUTO position. Verify fluid flow at flow meter, and verify pump motor speed (0 to 60 Hz) at the VSD unit display.
   Note: Water level drawdown can be observed at each groundwater recovery well through the programmable logic controller (PLC) software. This data can be observed by connecting a laptop computer (with loaded system software) to the PLC through the system modem plug.
4. Inspect piping and fittings for leaks, and verify pump flow rate on individual well flow meters.
5. Verify fluid level change within the storage tanks on tank level controller display panel.
6. Repeat the above steps for each recovery well brought on line.
7. Verify combined pumping rate for all operating wells on system flow meter (FQIT-201).
8. System operating parameters may be recorded on the system monitoring forms provided in Appendix B.

3.2 Normal Operation

The groundwater migration control system is virtually self-automated once the system has reached steady-state operation. However, it is necessary to perform daily and periodic checks on the groundwater extraction system. The operators are responsible for these checks as well as maintenance and compliance monitoring.

The ultrasonic level sensor (LIT-201) is mounted exterior to the control panel. Three programmed level conditions within the storage tank system will control groundwater recovery operations from the groundwater pumps and from the DPE system. The three water level conditions for LIT-201 control are as follows:

- ***High Level:*** Well pumps and DPE system OFF, when in the AUTO position.
- ***Mid-Low Level:*** In the case of decreasing water level from a High condition, the recovery systems will automatically restart when water level in the storage tanks goes below the mid-low level point.
- ***Low Level:*** With the pump HAND-OFF-AUTO selector switch placed in the AUTO position, storage tank transfer pump P-201 will turn off when this level is reached.

  Note: A "deadband" of several inches is provided for clearing each of the level conditions.

In the event that the ultrasonic level sensor/transmitter (LIT-201) fails, a secondary mechanical float-type level switch (LSHH) will shut off the groundwater recovery and DPE systems. No automatic restart will be allowed if this condition occurs. Instead, the system may only be manually restarted following ultrasonic level sensor inspection and repair and system reset using the main control panel door-mounted SYSTEM RESET button.

Water collected in the storage tanks will be periodically pumped into tanker trucks by a water transfer pump (centrifugal pump P-201) and transferred for off-site disposal. The pump will be manually operated to transfer groundwater from the storage tanks via PVC pipe and hose to water-hauling tanker trucks. The **main control panel** is equipped with an illuminated ON-OFF-AUTO selector switch for this pump.

This pump will also be controlled with an **auxiliary control panel** located in the immediate vicinity of the tanker truck and the transfer pump. This auxiliary control panel is equipped with an ON-OFF switch that only allows operation of the pump if the switch is placed to the ON position. The auxiliary control panel is also equipped with illuminated START-ON and STOP-OFF push buttons. The STOP-OFF push button will be illuminated red whenever the pump is de-energized (or when the switch is in the OFF position). The START-ON button must be pressed to start the pump and will illuminate green when the pump is ON.

The storage tank transfer pump P-201 will only actuate if ***all of the following conditions*** are met:

- The illuminated selector switch on the main control panel is placed in either ON or AUTO position.
- Water level within the storage tank system is above low level (in AUTO mode only).
- The selector switch on the auxiliary panel is placed in the ON.
- The START-ON push button on the auxiliary panel is pressed.
- The transfer volume displayed on the auxiliary panel is less than the pre-defined maximum allowable transfer volume (6,000 gallons). **Note:** Prior to initiating transfer of water, always reset the transfer volume on the auxiliary panel flow totalizer.

The storage tank transfer pump ***will stop automatically*** if the following conditions are met:

- The illuminated selector switch on the main control panel is in the AUTO position.
- Water level within the storage tank system reaches low level.
- The transfer volume displayed on the auxiliary panel reaches (or exceeds) the pre-defined maximum allowable transfer volume.

Note: Once the pump is turned off via the low level storage tank interlock, the pump must not be allowed to reinitiate operation until the START button is once again depressed with the switch in the ON position.

The storage tank transfer pump ***may be stopped manually*** at any time by doing any of the following:

- Pushing the STOP-OFF button on the auxiliary control panel.
- Turning the switch on the auxiliary control panel to OFF.
- Turning the illuminated selector switch on the main control panel to OFF.

Table 5-1 provides a summary of required daily and weekly monitoring activities.

3.3 Normal Shutdown

Normal shutdown of the groundwater migration control system is performed by following the steps below:

1. Turn the submersible water pump selector switches to the OFF position. The pumps will stop delivering water to the storage tank.
2. Turn the DPE system enable selector switch to the OFF position.
3. Turn the storage tank transfer pump selector switch to the OFF position. If operating, the transfer pump will shut off.
4. At the auxiliary control panel, turn the ON-OFF selector switch to the OFF position.
5. Disconnect, lockout, and tagout power to the groundwater migration control system at the service panel, as necessary, based on services to be performed.
6. If the system is to be shutdown for an extended period of time, turn the main disconnect at the master power panel to the OFF position.

Note:
If the system is to remain off for an extended period of time, all tanks, pumps, and piping lines should be drained of any accumulated liquids. Be aware that devices contained within the piping can hold small quantities of liquid within their bodies. If a potential freeze condition exists, this liquid should be removed. Equipment should be tarped. Motors should be turned monthly, momentarily either by placing the selector switches to HAND, or if power is not present, the motor shafts can be rotated by hand.

3.4 Emergency Shutdown

An emergency shutdown will occur automatically if the following operating condition occurs:

- High-high level alarm (LSHH) in the water storage tank system is contacted suggesting that the ultrasonic level sensor has failed.

System alarms are summarized in Table 3-1.

Table 3-1
Alarms Schedule for the Groundwater Recovery System

ANNUNCIATOR PANEL	
ALARM CODE	**DESCRIPTION**
LIT-201	High water level in water storage tank system
LIT-201	Low water level in water storage tank system
LSHH	High-high water level in water storage tank system

An emergency shutdown can also be manually initiated by performing the following steps:

- Press the emergency stop button located on the right side door of the master control panel.
- Turn the main power disconnect handle to the OFF position.
- Turn all the selector switches at the master control panel and at the auxiliary control panel to the OFF position.

3.5 Troubleshooting and Alternate Operation

The groundwater migration control system will shut down and cease discharge in the event of a system malfunction. The risk associated with inadvertent discharge of untreated groundwater in this situation is a violation of the wastewater discharge permit issued by the Westfield publicly-owned treatment works (POTW). Specific problems, their probable causes, and remedies are summarized in Table 3-2.

3.6 Autodialer System

The groundwater migration control system features an autodialer that will provide notification to the operator by fax in the event of a system fault condition. The conditions that activate the common alarm and are monitored by the autodialer are as follows:

- Any pump failure
- High level in the water storage tank system

System alarms are summarized in Table 3-1.

Table 3-2
Troubleshooting and Alternate Operations for the Groundwater Migration Control System

PROBLEM	PROBABLE CAUSE	REMEDY
Low-low level in water storage tank	Leak in the tank	Contact maintenance.
Flow out of recovery well is out of specifications	Globe valve on outlet not correctly set or clogged bag filter	Adjust outlet globe valve or change bag filter.
	Pump or motor failure	Check motor and pump for proper operation
DPE system will not operate	DPE system fault	Check DPE system panel and reset alarms
	DPE system not enabled at main control panel	Enable DPE system at main control panel
High level alarm in storage tank	Water has not been transferred from storage tank to tanker truck for off-site disposal	Call tanker truck operator
System will not start	Power failure	Check main power feed panel and/or power feed
Recovery well pump does not operate	Circuit breaker inside master control panel has been tripped	Reset the circuit breaker inside the master control panel to the ON position
	Power supply is not present	Supply power
	VFD operational parameters have not been properly set	Set VFD parameters according to design specifications
	An override condition exists	Check Miltronics Multiranger for malfunction
	Blockages are present in piping supply lines to the storage tank	Remove blockages in piping supply lines to the storage tank
High-high level alarm in storage tank	Ultrasonic level sensor failure	Check ultrasonic level sensor controller for failure
Storage tank transfer pump does not operate when the START button is pressed at the auxiliary control panel	Power is not supplied to the auxiliary control panel	Supply power to the auxiliary control panel
	Power is not supplied to the master control panel	Supply power to the master control panel
	Circuit breaker inside auxiliary control panel has been tripped	Reset the circuit breaker inside the auxiliary control panel to the ON position
	An override condition exists	Check water level in storage tanks
	Blockages are present in piping supply lines to the storage tank	Remove blockages in piping supply lines to the storage tank
	Thermal overload is tripped at the motor starter located in the master control panel	Reset thermal overload
	Total gallons pumped button on the flow totalizer has not been reset	Reset flow totalizer total gallon pumped button

Section 4
Maintenance of Groundwater Migration Control System

Table 4-1 is a summary of the preventive maintenance that is required for the groundwater recovery system. A more detailed description is given in the following subsections. Manufacturer/vendor equipment manuals are located in the treatment building and should be consulted for detailed maintenance and operating requirements.

4.1 Grundfos® Submersible Pumps

The submersible pumps require no maintenance other than periodic inspection and occasional cleaning. Each pump should be periodically checked for flow rate, discharge pressure, drawdown, period of cycling, and operation of controls. The motors have sealed bearings and require no lubrication.

If a pump fails to operate or there is a loss of performance, refer to Section 2, "Submersible Pumps" in the *Operation & Maintenance Procedures, Water Treatment System Controller* (BISCO, 2003) manual located in the treatment building.

4.2 Bag Filter

To service the bag filter unit and to replace the filter element, the following steps should be followed:

- Turn off all groundwater recovery pumps, and disable the DPE system by placing the DPE hand switch on the main control panel to OFF. Verify that all flow is stopped by observing the flow rate display at FQI-201.
- Close the two ball valves located directly upstream and downstream of the bag filter.

Caution: Depressurize filter vessel before loosening eye nuts. The bag filter can be depressurized by placing a bucket under the ball valve located on the bottom of the filter housing and turning the ball valve to the open position. This will release the water and pressure inside the bag filter. The bag filter vessels are equipped with threaded lid retainage bolts attached to the collar plate. The bolt and eye nut threads should be inspected each time a filter bag is replaced. Keep the threads clean and well lubricated with a suitable lubricant.

Table 4-1
Preventive Maintenance Summary Schedule for the Groundwater Migration Control System

GRUNDFOS® SUBMERSIBLE PUMPS		
The submersible pumps require no maintenance other than periodic inspection and cleaning. The pumps should be periodically checked to compare discharge flow rates and pressure against the manufacturer's established pump curve (flow-versus-head relationship). Also, drawdowns at each well should be monitored over time and compared to site-wide water levels to assess whether recovery well screws require cleaning to improve well hydraulics. The motors have sealed bearings and require no lubrication. If a pump's performance decreases by 20 percent or more, or if a pump fails to operate when all electrical connections are properly made, pull the pump and examine for scaling, silt deposits, tightness/condition of fittings, and piping.		
BAG FILTER		
Bag filter	Replace bag filter	When pressure differential exceeds 10 psi
Pressure gauges	Check operation and clean gauge	Every 3 months
CARBON FILTER		
System piping	Inspect for leaks	Each visit
Pressure gauges	Check operation and clean gauge face	Every 3 months
FLOW METERS		
Proline Promag 50	Replace gaskets	Every 6 months
Inlet screens	Clean screen	Every 3 months
TOTALIZER WATER METERS		
Badger 450 Turbo – vanes	Clean vanes	Every 6 months
CENTRIFUGAL PUMP (P-201)		
Gusher pump	Lubricate	As needed, or every 6 months
	Coupling alignment	Every 6 months or 1,200 hours of operation
TANKS (1)		
Exterior surface	Inspect for leaks/deterioration	Monthly
Flanges, valves, and connections	Inspect for leaks	Monthly

Table 4-1
Preventive Maintenance Summary Schedule for the Groundwater Migration Control System

STORAGE TANK LEVEL SENSORS		
LSHH (2)	Ensure high-high water level condition overrides power to the recovery well pumps, storage tank transfer pump, DPE system, and illuminated indicator at controller	Monthly
LSH (2)	Ensure high water level condition overrides power to the recovery well pumps, DPE system, and illuminated indicator at controller	Monthly
LSL (2)	Ensure low water level condition overrides power to the storage tank transfer pump and illuminated indicator at the auxiliary control panel.	Monthly
CONTROLLER		
Indicator bulbs	Ensure bulbs are working	Monthly
Enclosure	Remove dust and dirt from exterior	Monthly
Interior	Inspect for and remove accumulated moisture	Monthly

(1) Includes water storage tanks and carbon units
(2) After testing these overrides and after the sensor is returned to normal operating position, the RESET button at the controller will need to be pressed.

Inspect the filter media regularly to prevent excessive drop through the filter unit. Monitoring of differential pressure through the housing unit can also be utilized as a means of determining whether or not the filter media needs cleaning or replacement.

Each time a bag filter is changed, remove the lid O-ring, clean the groove, and replace the O-ring if it is worn or nicked.

4.3 Carbon Filter

Maintenance of the individual components of the carbon filter are discussed in the following subsections.

4.3.1 Liquid Carbon Adsorption Units

Minimal preventive maintenance is required of the adsorber unit. System piping should be checked for leaks during each visit. Metal surfaces should be touch-up painted as required.

Pressure gauges should be maintained every 3 months as follows:

- Visually inspect for proper operation.
- Clean gauge face.
- Test for operating accuracy with calibrated gauge or dead weight tester.

During each carbon replacement operation, the following tasks should be performed:

- Visually inspect for cracks, chips, blistering with flashlight via sideshell manway.
- Measure film thickness with dry film thickness gauge.
- Check for pinholes and voids using a park tester.

Underdrain Screens

Inspect septas in adsorber and check for wear, screen opening, or pinholes in assembly.

Carbon Replacement

Replace carbon in the carbon adsorption units when analytical data from samples obtained from the carbon units indicate breakthrough has occurred.

4.3.2 Vapor Carbon Adsorption Units

Minimum preventive maintenance is required of the carbon adsorption unit. Flow through the carbon unit is produced by the filling of the storage tanks.

Every month the following maintenance should be performed:

- Check piping for leaks.
- Verify connections are sealed at carbon drum.

Carbon Replacement

Replace carbon in the carbon adsorption units when analytical data from charcoal tube samples or PID sampling indicates breakthrough has occurred.

4.4 Magnetic Flow Meter

The flow meters require no special maintenance other than periodic inspection and occasional cleaning. When cleaning, remove all dust, dirt, moisture, or other foreign materials from exterior of meter using a cleaning agent, which does not attack the surface of the housing or seals.

Periodically replace the seals of the Promag H sensor, particularly in the case of gasket seals. The period between changes depends on the frequency of cleaning cycles, the cleaning temperature, and the fluid temperature.

4.5 Nutating Disc Flow Meter

Periodic inspection and cleaning should be performed at regular intervals and any defects should be corrected before further operation. Visually inspect meter and accessory for missing hardware, loose connections, broken register glass, damaged wiring, or other signs of wear or deterioration. Repair or replace components as necessary. Verify proper flow rate and pressure. A loss in pressure with corresponding decrease in flow rate may indicate that the meter screen is clogged and requires cleaning. Refer to the Badger Flow Meter M25 section of the *LNAPL Extraction and Property Line Migration Control System Equipment Literature Manual* (RMT, 2003). Clean dust, dirt, grease, moisture, or other foreign material from exterior of meter and applicable accessory.

4.6 Badger Cold Water Recordall Turbo 450 Meter

The Badger Turbo 450 meter should be cleaned periodically to prevent excessive wear of the multi-vaned rotor. The period between cleanings depends on the total suspended solids concentration of the water.

4.7 Ultrasonic Level Controller

The level controller requires no special maintenance. However, if performance changes are observed, immediately shut down the level measurement system and perform a thorough inspection.

4.8 Centrifugal Pump

Maintenance tasks associated with the centrifugal pump are discussed in the following subsections.

4.8.1 Lubrication

Using a lubrication record, a proper lubrication schedule should be established after the first 6 months of operation. Clean and flush bearings with kerosene or carbon tetrachloride approximately once a year, and then fill with fresh grease.

4.8.2 Coupling Alignment

Check coupling alignment before and after system start-up, after 300 hours of operation, and after 1,200 hours of operation. Establish a routine preventative maintenance program as indicated by monitoring results during the first 6 months of operation.

4.8.3 Packed Stuffing Box

Do not stop leakage of stuffing box. When leakage can no longer be controlled by drawing upon the packing gland, add another ring of packing to the stuffing box. If leakage continues, replace packing according to manufacturer's instructions. Refer to Gusher Pump section of *LNAPL Extraction and Groundwater Migration Control System Equipment Literature Manual* (RMT, 2003).

4.8.4 Electric Motor

The Weg electric motor used to power the gusher pump should be kept clean and free of dust, debris, and oil. Soft brushes or clean rags should be used for cleaning. A jet of compressed air should be used to remove nonabrasive dust from the fan cover and any accumulated grime from the fan and cooling fins. Oil or damp impregnated impurities can be removed with rags soaked in a suitable solvent.

The Weg motor is equipped with a grease-lubricated ball or roller bearings. Bearings should be lubricated to avoid metallic contact of moving parts, and also for protection against corrosion and wear.

4.9 Storage Tanks

The storage tanks should be checked periodically for rust and corrosion. Any observed rust or corrosion areas should be sanded and painted as necessary.

4.10 Main Control Panel

The main control panel will be capable of operating the groundwater recovery system in "automatic" or "manual" mode. The main control panel will also provide override control for activation or deactivation of the DPE system. In addition, the main control panel contains each of the following RED alarm/indicator lights:

- Storage Tank Low Water Level
- Storage Tank High Water Level
- Storage Tank High-High Water Level
- DPE System Fault

The main control panel incorporates space to allow for future expandability of up to three additional recovery wells (switches, VFDs, terminal blocks, etc.) and three additional discrete control inputs and three discrete outputs.

4.11 Systems Telemetry

A modem-based telemetry system is included on the main control panel for remote PC access to system information and process data. Specific system parameters for telemetry are as follows:

- **Storage Tank Level –** Continuous readout in feet of water and status/setpoint of identified control levels and alarms.
- **Recovery Well Water Level –** Continuous readout of water levels of each well in feet.
- **Recovery Well Pumps –** Continuous readout of pump speed in percent of full speed.
- **Groundwater Recovery Total Flow Rate and Volume –** Readout of instantaneous flow and cumulative volume for the total system based on signals from FQI-201.
- **DPE System**
  - System Faults

Section 5
Routine Monitoring, Record Keeping, and Laboratory Testing of Groundwater Migration Control System

The following section describes the routine monitoring, record keeping, and laboratory testing activities necessary to evaluate system performance and to meet the requirements of the Industrial Discharge Permit. The activities will help to document and indicate whether the objectives of the groundwater recovery system described in the *Interim Corrective Measures Workplan and Design Report* (RMT, 2002) are being met. The operator will normally be at the site twice during the workweek. The system autodialer will automatically notify the predetermined personnel in the event of an alarm condition.

5.1 Monitoring Objectives

The objective for monitoring the groundwater migration control system is to verify that the system is effectively controlling groundwater flow and the migration of VOCs in groundwater along the northern property line.

5.2 Monitoring Activities and Schedule

Monitoring activities associated with the operation of the groundwater migration control system are discussed in the following subsections.

5.2.1 Groundwater Migration Control System

The routine monitoring activities to be performed on the groundwater migration control system are summarized in Table 5-1. These routine activities include both mechanical checks and routine system monitoring necessary to evaluate system performance and meet the requirements of the Industrial Discharge Permit (Appendix C). Operational indicators for the operating equipment (pumping rates, pressures, total volumes, etc.) will be monitored and recorded on a regular frequency to verify proper operation of the system. System monitoring will include daily monitoring for optimization for the first week, followed by a weekly schedule for long-term operation.

Monitoring forms for the groundwater migration control system are included in Appendix B.

Table 5-1
Groundwater Migration Control System Monitoring Plan

GROUNDWATER		
MONITORING PARAMETER	**FREQUENCY/SAMPLING TIME AFTER STARTUP**	**SAMPLE LOCATION**
Field Measurements		
Water level measurements	Baseline – prior to startup 1 week 2 weeks 3 weeks 1 month 2 months 3 months Quarterly	– MW-4S – MW-11I – MW-13S – MW-20B – MW-20C – MW-24S – MW-25S – MW-28S – MW-32I – MW-32S – MW-35S – MW-39S – MW-40I – MW-40S – MW-41S – MW-43S – MW-45S – MW-46S – MW-51S – MW-53I – MW-54I – RW-01 – RW-02 – RW-03 – RW-04 – RW-05 – RW-06 – RW-07 – OW-01 – OW-02 – OW-03 – OW-04 – OW-06 – OW-07 – OW-08 – OW-09 – OW-10
Laboratory/Field Analyses(1) VOCs pH Specific conductance Temperature	Baseline – prior to startup Semiannual	– MW-11I – MW-20B – MW-20C – MW-24S – MW-32S – MW-32I – MW-40S – MW-40I – MW-43S – MW-45S – MW-46S – MW-51S – MW-53I

(1) Additional/replacement monitoring wells may be added to the existing north-end monitoring network. All additional north-end monitoring wells will be included in the sampling program.

5.2.2 Groundwater Monitoring

Water levels from existing groundwater monitoring wells and nine new observation wells will be monitored throughout the duration of the remediation activities. Five of the observation wells (OW-03 through OW-07) are installed between groundwater recovery wells to provide water level data along the northern property boundary from which flow and capture can be evaluated. These wells are constructed so that they can be converted to groundwater extraction wells if additional groundwater capture becomes necessary. Two of the observation wells are installed upgradient (west-northwest) of RW-01 to monitor water level elevation and calculate areas of pumping influence upgradient of the system. These wells are also constructed as 6-inch wells, so that they can also be converted to groundwater recovery wells, if necessary. The remaining two observation wells are installed north of the former reflecting pond. These wells are constructed as 2-inch observation wells and are monitored to assess the sidegradient influence of the system.

A baseline groundwater sampling event was conducted prior to system startup. Groundwater samples will be collected from select on-site and off-site monitoring wells located north of the facility and analyzed for VOCs by SW-846 Method 8260B. After system startup, groundwater samples will be collected from the same wells and analyzed semiannually for VOCs.

5.2.3 Industrial Discharge Permit Requirements

Recovered groundwater will be collected by the City of Westfield WPCP personnel on a monthly basis and analyzed for parameters specified by the Industrial Discharge Permit for the MTD-Westfield facility. A grab sample will be collected from the tanker truck and shipped on ice by overnight carrier to the following United States Environmental Protection Agency (USEPA)-approved analytical laboratory:

Spectrum Analytical, Inc.
11 Almgren Drive
Agawam, Massachusetts 01001
(413) 789-9018

In addition, a grab sample will be collected from each load of groundwater transported to the City of Westfield WPCP and analyzed for pH. Analytical parameters, daily limits, and monitoring frequencies are summarized in Table 5-2.

Table 5-2
Groundwater Discharge Analytical Requirements

PARAMETER	DAILY LIMITS [1]	MONITORING FREQUENCY
Flow	30,000 gallons per day	Daily
pH	5.5 to 9.5 standard units	Per load
Aluminum	0.9	Monthly
Cadmium	2	
Chromium	4	
Copper	4	
Lead	2	
Manganese	10	
Mercury	0.2	
Nickel	6	
Silver	2	
Zinc	10	
Cyanide	2	
Total suspended solids	10	
Total toxic organics	2.13	

[1] Daily limits are reported in milligrams per liter (mg/L) unless otherwise specified.

Records will be retained for a minimum of 10 years. Records will be maintained at the site for inspection by the City of Westfield WPCP during normal business hours.

The project manager will report any noncompliance with the conditions or limitations of the Industrial Discharge Permit that may endanger public health or the environment. The project manager shall notify the City of Westfield WPCP verbally within 24 hours of becoming aware of such conditions by contacting the City of Westfield WPCP during normal business hours at (413) 572-6227.

Section 6
Light Non-aqueous Phase Liquids Extraction System Description

DPE is a proven and effective method of rapidly removing LNAPL from groundwater and from unsaturated soils. The technology utilizes a high vacuum pump, typically capable of 25 to 30 inches of mercury (In-Hg) vacuum, which is directly connected to a below grade extraction system. The technology is applicable for both LNAPL and groundwater recovery in aquifers with a hydraulic conductivity ranging from 10^{-3} to 10^{-5} cm/sec. For applications where the groundwater table is less than 25 feet below the ground surface, liquids can be physically lifted into the system by the applied vacuum. In addition, the applied vacuum removes VOCs, including LNAPL, that are adsorbed to unsaturated vadose zone soils by volatilization and subsequent removal of the soil vapors through the well and connected piping system.

DPE is generally designed with a drop pipe, or "stinger," placed into recovery wells that are screened in both the saturated and unsaturated soil zones. The drop pipes are attached via a piping manifold to a liquid-ring or positive displacement pump capable of applying the required vacuum level to the subsurface. Depending on the depth of the drop pipe in the recovery wells, the applied vacuum will remove groundwater, overlying LNAPL, and/or soil vapors. The removed fluid/vapor mixture is separated aboveground and treated or disposed of according to local requirements.

DPE has been selected as the preferred technology for interim measures for LNAPL remediation because

- it is a proven means for effective and rapid removal of LNAPLs;
- site conditions (*i.e.,* depth to groundwater and hydraulic conductivity) are amenable to the technology; and
- remediation equipment is readily available for deployment as an interim action.

The DPE system is a trailer-mounted, self-contained, and self-controlled system. The proposed system layout for the DPE system, system design plans, and installation specifications are provided in Appendix A. A DPE well schematic is provided as Figure 6-1. Major system components are summarized in Table 6-1. The following subsections describe the various system components and their functions.

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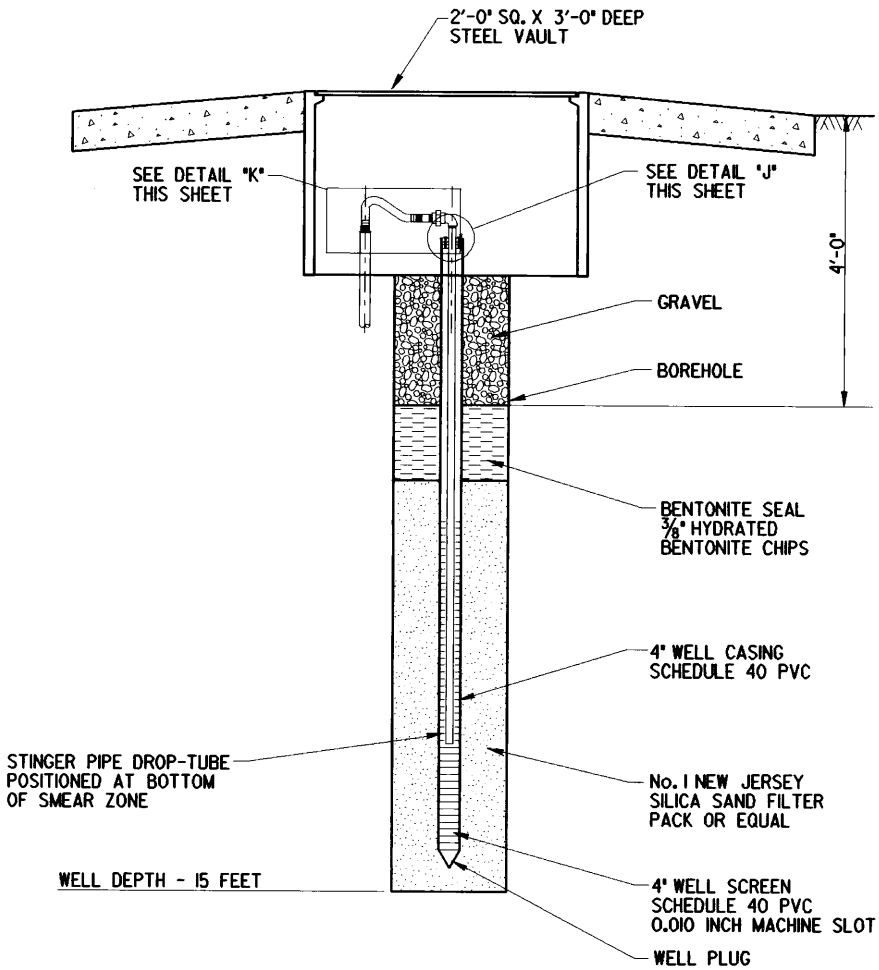
AHS 7/1/2003



RMT INC.

MTD PRODUCTS
COLUMBIA MANUFACTURING FACILITY
WESTFIELD, MASSACHUSETTS

DUAL-PHASE VACUUM EXTRACTION
WELL SCHEMATIC

DRAWN BY:	AHS
APPROVED BY:	BEC
PROJECT NO.	998.81
FILE NO.	DTG-90.998.66-006-1.DGN
DATE:	JULY 2003

FIGURE 6-1

Table 6-1
Major System Components for the Light Non-aqueous Phase Liquids Extraction System

ITEM	EQUIPMENT NAME	VOLUME OR CAPACITY
DPE-01/02/ 03/04/05/ 06/07	Pressure gauge for DPE wells	0 – 60 psi
	Knock-out tank	250 gallons
	Particulate filter	
	Liquid-ring vacuum pump (Travaini)	Vapors: 300 acfm @ 28 in-Hg Liquids: 2 gpm (approximately)
	Air-to-air heat exchanger (Xchanger, Inc.)	1,000 standard cubic feet per minute (scfm)
	Vapor carbon filters	3.3 feet^3
	Progressive cavity transfer pump for knock-out tank (Moyno)	1800 rpm
	Bag filter (Rosedale)	Up to 50 gpm
	Oil-water separator	10 gallons
	Oil storage drum	55 gallons
ME-05	Water transfer tank	200 gallons
	Water transfer tank centrifugal pump (Goulds)	10 gpm
ME-07	Flow totalizer (Badger)	½ to 25 gpm
ME-02	Air flow meter (ERDCO)	0 – 300 cfm
ME-04	Pressure gauge for progressive-cavity pump	0 – 60 psi
ME-06	Pressure gauge for water transfer pump	0 – 60 psi
ME-07	Temperature gauge for liquid-ring vacuum pump	0 – 230 F
ME-08	Pressure gauge for liquid-ring vacuum pump	0 – 60 psi

6.1 Dual-phase Vacuum Extraction Wells

Seven DPE wells are installed in the northern LNAPL area. The well layout provides the flexibility to add additional wells to improve capture and treatment of the impacted area, if needed to remove LNAPLs to the maximum extent practicable. Each of these DPE wells are completed to a depth of approximately 15 feet and are constructed of 4-inch diameter, Schedule 80 PVC pipe. Each well is constructed with a 10-foot section of 0.010-inch, factory-slotted well screen installed to bracket the observed water table thus providing for both liquid and soil vapor recovery. A well construction summary for each DPE well (*i.e.*, total depth, screened interval, etc.) is included on Figure 6-1. DPE well construction details are provided in Appendix A.

DPE wells are completed below grade with flush-mount well vaults. Each well head is sealed with a vacuum-tight cap. The cap contains a vacuum-tight opening for stinger pipe insertion and a port for vacuum gauge installation.

6.2 Dual-phase Vacuum Extraction Pipelines

Galvanized 1½-inch diameter steel pipe will connect each DPE well to the DPE vacuum extraction system. The DPE pipelines will be installed either to a minimum of 4 feet below grade or will be insulated and heat-traced for freeze protection. Each DPE pipeline is equipped with a flow control valve, a vacuum indicator, and a sample port for well-specific control and data monitoring. The individual pipelines are joined at a common header-manifold within the trailer-mounted equipment enclosure.

6.3 Liquid-Ring Vacuum Blower and Liquid-vapor Separator

Soil vapors, groundwater, and LNAPL will be extracted as a combined recovery stream by the liquid-ring vacuum blower. The liquid-ring blower is capable of extracting a total of 300 actual cubic feet per minute (acfm) at a vacuum of 28 inches Hg. The blower will also lift LNAPL and groundwater from the DPE wells at an estimated rate of less than 2 gpm. The ratio of vapor to fluids extracted from the DPE wells is dependent on the vertical positioning of the drop pipe and well-specific aquifer conditions.

Extracted vapors and liquids will discharge from the DPE pipeline into a 150-gallon liquid-vapor separator, equipped with a de-misting pad for efficient vapor-liquid separation. The separator will be equipped with high-high level, high level, and low level switches for automatic separator tank drainage, and for full system shutdown in the event of a discharge pump malfunction.

Separated vapors are routed through an air-to-air heat exchanger and then through two 400-pound beds of granular activated carbon (GAC) prior to discharge to the atmosphere.

The separated liquids, consisting of a combined water and LNAPL stream, will be discharged automatically with a Moyno progressive-cavity transfer pump to an oil-water separator. The pump will turn on when the water level within the tank reaches the high level switch, and the pump will turn off when the water level returns to the low level switch elevation. If the pump fails and the water level within the tank reaches the high-high level switch elevation, the system will automatically shut down, and a system alarm will be activated. The system can be manually restarted once the DPE system fault located on the DPE control panel is acknowledged by depressing the alarm reset button.

6.4 Oil-Groundwater Separator

The water and LNAPL mixture will be pumped from the liquid-vapor separator into a 10-gpm capacity oil-water separator. This separator will be capable of removing free and dispersed non-emulsified oil from the water and will consist of the following components:

- Quiescent inlet basin to promote oil-water (and settleable solids) separation.
- Separation chamber consisting of parallel, corrugated plates angled at approximately 45 degrees to minimize oil separation distance.
- Under-flow oil retention baffle will retain oil within the separation chamber while allowing water to flow to the effluent chamber.
- Effluent chamber with an integral overflow weir

6.5 Oil Storage

Separated LNAPL will be pumped into a Department of Transportation (DOT)-approved 55-gallon drum for temporary storage. The drum will be equipped with a high level switch to turn system pumps off when product levels reach the predetermined height.

6.6 Groundwater Transfer

The water that has been collected and separated through the oil-water separator unit will be pumped using a Goulds® centrifugal pump through a buried 1-inch diameter HDPE pipeline into two aboveground storage tanks at the site that are also designed to accept water from the groundwater recovery system. The tanks will be constructed of carbon steel and are sized for a maximum of 13,600 and 15,500 gallons, respectively. An in-line flow meter will record groundwater volume discharged from the DPE system.

6.7 Vapor Treatment

Vapors from the liquid vapor separator will be routed through a particulate filter to protect the liquid-ring vacuum pump. The vapors will then pass through an air-air heat exchanger and then through two series-operated activated carbon drums prior to discharge to the atmosphere.

6.8 Dual-phase Vacuum Extraction System Controls

The **main control panel** contains a HAND-OFF-AUTO selector switch to provide overriding control of the DPE system. The switch will not be illuminated, unlike the other main control panel switches, and does not indicate that the DPE system is operating but that it is "enabled."

The **DPE system control panel** supplied with the unit is located on the outside of the system trailer. The DPE control panel has a lockable exterior door and an internal door that contains HAND-OFF-AUTO selector switches for the vacuum blower, the fluid transfer pump, the groundwater transfer pump, and the air-air heat exchanger. The interior door also contains five alarm lights. The alarm lights will illuminate individually for the following conditions:

- High fluid level in fluid-air separator tank
- High water level in water storage tank
- High oil level in oil storage drum
- High or low oil level in vacuum blower
- High temperature at vacuum blower

If any of these conditions occur, the DPE system will shut off automatically and can be restarted only when the condition is corrected and the SYSTEM RESET button located on the interior door of the DPE control panel is pressed. Telemetry output also includes a DPE system fault condition **RED alarm light on the main control panel**. This alarm condition will not shut off any other system component. However, the DPE system cannot be restarted until the fault condition within the DPE system is cleared.

Section 7
Operation of Light Non-aqueous Phase Liquids Extraction System

The LNAPL extraction system is designed for automated operation. The operator is responsible for routine inspections, maintenance, compliance monitoring, and troubleshooting in the event of a system failure or diminished treatment performance.

The following sections describe the tasks required for startup, normal operation, normal shutdown, emergency shutdown, troubleshooting, and alternate operation.

7.1 Initial Startup

Note:

The initial startup of the system requires the operator to verify that each system component is prepared for operation. This step-by-step check is necessary to protect process equipment and to ensure compliance with environmental operating permits.

To initiate DPE system operations, the system operator must do the following:

1. Enable the system by placing the AUTO-ON-ENABLE switch on the main control panel to the ENABLE position.
2. Open ball valve to allow atmospheric air to enter the liquid-ring vacuum pump.
3. Inspect all piping, valves, and gauges for integrity.
4. Verify that system valves (other than intake valves to the DPE wells) are fully open for proper hydraulic flow through the system. This includes valves within the DPE system enclosure (trailer) and valves within the main storage tank building. Verify that all sample taps are closed.
5. Place hand switches for the two waste transfer pumps in the AUTO position. Place the hand switch for the heat exchanger in the AUTO position.
6. Place hand switches for the liquid-ring vacuum pump in the AUTO position. Verify an increase in temperature on blower gauges, and verify that the blower vacuum operates in the 20 in-Hg to 29 in-Hg vacuum range. The normal operating temperature range is 50°F to 200°F. If the temperature exceeds 200°F, the dilution air should be opened, or air flow from recovery wells should be increased.
7. Slowly open one intake valve to initiate oil/groundwater collection from a selected DPE well. Verify fluid flow at the See-Flo meter installed on the air intake line. Inspect the

wellhead of the operating well to identify potential leakage at the sanitary well seal. Tighten the sanitary well seal as necessary.

8. Open intake valves for other DPE wells one at a time, and verify fluid flow from each well individually. Inspect each wellhead for leakage while operating, and tighten the sanitary seal as necessary. As air flow from more DPE wells is initiated, monitor blower vacuum to verify that the operating vacuum is between 20 in-Hg and 29 in-Hg. Close dilution air valve or throttle DPE well valves, as necessary, to maintain blower vacuum in the prescribed range.
9. Optimize fluid flow from those wells containing the greatest thickness of oil by fully opening the intake valves for these wells. Open the remaining intake valves, as appropriate, to establish fluid flow.
10. Monitor air emissions from the vacuum blower, from the effluent of the lead GAC vessel, and from the lag GAC vessel at 1-hour intervals using a photoionization detector (PID) during initial system operations to assess GAC loading. Collect a vapor sample for laboratory analysis.
11. If the rate of fluid recovery decreases, adjustments to the vertical position of each DPE well's drop pipe may be required. Make adjustments in 2-inch increments. Verify fluid flow after each adjustment.
12. As fluid recovery progresses, observe proper operation of the fluid/air separation tank discharge pump. During pump operation, inspect piping and fittings for leaks. Inspect the oil/water separator tank for proper filling, and inspect fittings for leaks.
13. Prior to reaching high level within the oil/water separator that will initiate gravity discharge to the water transfer tanks, verify that the tank system within the main treatment building is prepared to accept water.
14. Upon reaching high level within the water transfer tank, observe proper operation of the DPE system discharge pump. Verify that the discharge flow meter is operational while the pump is discharging water.
15. Collect a sample of the discharged fluid to evaluate water quality.
16. System operation parameters may be recorded on the monitoring forms included in Appendix B.

7.2 Normal Operation

The LNAPL extraction system is virtually self-automated once the system has reached steady-state operation. However, it is necessary to perform daily and periodic checks on the DPE wells and the LNAPL extraction system. The operators are responsible for these checks as well as maintenance and compliance monitoring.

A list of the necessary checks is summarized in Table 9-1. These checks include vacuum pressure and flow rate, emissions monitoring, and LNAPL and water level measurements.

For operation of the DPE system, ***all of the following*** conditions must occur:

- The HAND-OFF-AUTO switch on the **main control panel** must be placed in either the HAND or AUTO position. This switch is equipped with spring-return in the HAND mode. In the HAND position, the DPE system will be energized continuously. In the AUTO position, the DPE system will be energized until high level in the storage tanks is reached.
- The HAND-OFF-AUTO selector switches on the **DPE control panel** are placed in the HAND or AUTO position.

The DPE system will shutdown if ***any of the following*** occur:

- The HAND-OFF-AUTO switch on the **main control panel** is placed in the OFF position.
- Each of the three HAND-OFF-AUTO selector switches on the **DPE control panel** are placed in the OFF position.
- A DPE system fault condition occurs and the DPE system is operating in AUTO mode.
- Water level in the storage tanks reaches high level and the selector switch on the main control panel is in AUTO.

7.3 Normal Shutdown

Normal shutdown of the LNAPL extraction system is performed using the following procedure:

1. Open ball valve to allow atmospheric air to enter the liquid-ring blower and to reduce the operating pressure of the liquid-ring blower.
2. Turn off the liquid-ring vacuum pump.
3. Turn off all remaining pumps and controllers following a 15-minute delay.
4. Close all valves in the system.

7.4 Emergency Shutdown

An emergency shutdown will occur automatically under several different operating conditions. Any of the following conditions will violate the system permissives and cause a system shutdown:

- High-high level alarm in knock-out tank
- High-high level alarm in transfer tank
- High temperature alarm in the liquid-ring vacuum pump
- High or low oil level in liquid-ring vacuum pump

Emergency shutdown may also be accomplished by utilizing the MAIN POWER DISCONNECT switch on the front of the system trailer.

7.5 Troubleshooting and Alternate Operation

The LNAPL extraction system will shut down in the event of a system malfunction. In the event of a shutdown, the main control panel will send a fax to the operator indicating that a DPE fault has occurred. Specific problems, their probable causes, and remedies are summarized in Table 7-1.

7.6 Autodialer System

In the event a DPE system fault occurs, the main control panel will send a fax to the system operator indicating that a DPE fault has occurred.

Table 7-1
Troubleshooting and Alternate Operation for the Light Non-aqueous Phase Liquids Extraction System

PROBLEM	PROBABLE CAUSE	REMEDY
Liquid-Ring Vacuum Pump Blower Systems		
Low or no flow Low vacuum	Blower is shut off	Check breakers and reset, if necessary.
	Air filter is clogged.	Replace particulate filter
	Valves are closed.	Open valves for proper flow.
	High level switch in liquid-vapor separator is activated.	Drain water from the liquid-vapor separator.
Overload	Condensation is present in panel.	Check panel for condensation and remove, if necessary.
	No power to blower.	Contact an electrician.
High flow	Influent valve is open too much.	Adjust valve for proper flow rate.
Liquid-Vapor Separator and Water Transfer Pumps		
Low or no flow	Pump is shut off.	Check breakers and reset, if necessary.
	Discharge water line is clogged.	Clear obstruction.
	Valves are closed.	Open valves for proper flow.
Overload	Condensation is present in panel.	Check panel for condensation and remove, if necessary.
	No power to pump.	Contact an electrician.
High flow	Influent valve is open too much.	Adjust valve for proper flow rate.
High/high	Power.	Check power.
	Pump is clogged.	Clean pump.
	Lost prime to pump.	Re-prime pump.
Vacuum Problems		
High vacuum	Low flow.	Adjust influent valve for proper flow rate.
	Valve is partially or fully closed.	Check valve alignments and adjust valves, if necessary.
	Vacuum gauge is faulty.	Replace vacuum gauge.
No vacuum	No power to blower	Check circuit breaker to blower and reset, if necessary.
	Low flow rate.	Open influent valve to ensure proper flow rate.
	A leak is present in the manifold.	Repair or replace faulty section of manifold.
	Vacuum gauge is faulty.	Replace vacuum gauge.

Table 7-1
Troubleshooting and Alternate Operation for the Light Non-aqueous Phase Liquids Extraction System

PROBLEM	PROBABLE CAUSE	REMEDY
Power Problems		
Blower will not operate	Circuit breaker is tripped. Please note separate breakers for blowers and discharge pump.	Allow well to recover. Then, restart blower and reduce flow rate to prevent excessive well loss.
	Breaker is off or tripped.	Reset breaker unless otherwise tagged. Replace 15-amp and 20-amp fuses, if blown.
DPE System		
DPE system will not operate	DPE enable selector switch is not in the AUTO position	Place DPE enable selector switch in the AUTO position
	An override condition exists that inhibits DPE system operation	Check DPE Control Panel for faults or alarm. Address alarm condition, as appropriate.

Section 8
Maintenance of Light Non-aqueous Phase Liquids Extraction System

Table 8-1 is a summary of the preventive maintenance that is required for the LNAPL extraction system. A more detailed description is given in the following subsections. Manufacturer/ vendor equipment manuals are located in the treatment building and should be consulted for detailed maintenance and operating requirements.

8.1 Knock-Out Tank

The knock-out tank does not require a specific preventive maintenance schedule. The exterior of the tank should be inspected periodically for rust and leaks. Any areas of rust should be sanded and painted immediately. A leak in the knock-out tank could be an indication of a failed weld. Schrader Environmental Services should be contacted if a leak is detected in the knock-out tank.

8.2 Particulate Filter

The particulate filter on the Travaini liquid ring vacuum pump should be inspected monthly for the presence of particulate matter. If the filter appears dirty or saturated with oil, a new filter should be installed. Prior to installation of the new particulate filter, a thin layer of liquid gasketing material should be placed over the two gasket faces of the new filter.

8.3 Liquid-Ring Vacuum Pump

Every 100 to 200 working hours, the oil level in the frame reservoir should be checked and make-up oil added, if necessary. Oil in the reservoir should be changed every 10,000 working hours. All bearings were lubricated with quality grease at the time of assembly. If a problem develops with the mechanical seal of the pump, Section 1 of the *Dual Phase Extraction Environmental Treatment System Operation and Maintenance Manual* (Schrader, 2002) should be referenced.

8.4 Air-to-Air Heat Exchanger

Condensate within the air-to-air heat exchanger should be drained weekly by removing the condensate drain plug.

Table 8-1
Preventive Maintenance Summary Schedule for the
Light Non-aqueous Phase Liquids Extraction System

LNAPL EXTRACTION SYSTEM		
System plumbing	Inspect for integrity	Weekly
Electrical connections	Inspect	Monthly
Flow sensors	Inspect	Quarterly
Air bleeds, pressure gauges, sample ports	Inspect	Quarterly
Camlocks and fittings	Inspect	Quarterly
LIQUID-RING VACUUM PUMP SYSTEM		
Liquid-ring vacuum pump	Inspect	Monthly
Liquid-ring vacuum blower	Inspect plumbing	Monthly
	Grease blower	Monthly
	Check conditions (amps, volts, controllers, windings)	Monthly
Particulate Filter	Inspect	Monthly
FLOW METERS		
	Review flow rates	Weekly
	Inspect	Monthly
TANKS		
Exterior surface	Inspect for leaks/deterioration	Monthly
Flanges, valves, and connections	Inspect for leaks	Monthly
O-rings	Inspect for deterioration	Quarterly

(1) Includes water storage tanks, liquid-vapor separator and carbon units
(2) After testing these overrides and after the sensor is returned to normal operating position, the RESET button at the controller will need to be pressed.

8.5 Granular Activated Carbon Drums

Two GAC drums are installed in series to remove VOCs from the vapors discharged by the liquid ring vacuum pump. Effluent air (vapor phase) samples are collected on a biweekly basis to evaluate the status of the carbon drums. Whenever VOCs are detected above the detection limit in the effluent vapor stream of the carbon drums, the carbon within the drums should be replaced.

8.6 Progressive-cavity Transfer Pump for Knock-Out Tank

The Monyo® progressive-cavity transfer pump for the knock-out tank does not require a regular maintenance schedule. Should an audible change in operation be detected, the manufacturer should be contacted.

8.7 Bag Filter

When a differential pressure of 10 psi is measured in the Rosedale bag filter unit, the bag filter should be replaced. The Goulds® transfer pump should be switched to the off position prior to changing the bag filter. The ball valves used to isolate the bag filter should be rotated to the closed position. A 5-gallon bucket should be positioned under the ball valve located on the bottom of the bag filter housing. The ball valve on the filter housing should be turned to the open position to allow pressure to be relieved from the bag filter unit. The eye nut assemblies should then be loosened until the top of the filter housing can be removed. Remove the old bag filter and replace with a new filter. Verify that the O-ring is in place prior to replacing the top of the filter housing. Replace the O-ring if it is damaged.

8.8 Oil-Water Separator

Maintenance activities associated with the oil-water separator are discussed in the following subsections.

8.8.1 Sludge Removal

Sludge should be periodically removed from the oil-water separator to prevent excessive accumulation and interference with normal operation. Sludge removal should be performed while the oil-water separator is in operation to prevent coating the tank walls with separated product. Sludge may be removed using the gravity flow method or the pump out method. The gravity flow method requires that a valve be placed on the sludge outlet to allow easy stop/start and to allow fine control of the discharge. When using gravity drain, use the head pressure in the tank to expel sludge chamber contents.

The use of this method is limited by the distance and height of discharge. Pump out systems allow more flexibility in the distance of discharge.

Refer to the equipment manual to determine sludge hopper volume, outlet locations, and sizes. Plumbing in a short section of clear PVC pipe is recommended to visibly monitor sludge depletion. Sludge removal frequency can be determined once full operation of the system has been established. Remove sludge after 3 to 5 days of operation. If the volume of sludge removed is less than anticipated, decrease the frequency of sludge removal. If the volume of sludge removed is greater than expected, increase the frequency of sludge removal. The sludge may need dewatering prior to disposal.

8.8.2 Cleaning

Periodically clean the oil-water separator tank and oil separation media using the following procedure:

1. Stop the flow to the oil-water separator and empty the tank. Empty the effluent reservoir, if necessary.
2. Remove the oil separation media being careful not to damage it.
3. If the oil separation media is plugged, remove the solids with hot or warm water under pressure. The oil separation media may also be placed in or sprayed with a detergent solution. If a detergent if used, rinse the oil separation media **thoroughly**.

8.9 Oil Storage Drum

The oil storage drum for free product should be inspected periodically for leakage. If any leaks are detected, Schrader Environmental Services should be contacted.

8.10 Water Transfer Tank

The water transfer tank should be inspected periodically for leakage. If any leaks are detected, Schrader Environmental Services should be contacted.

Additionally, at low tank level, the level switches within the tank controlling water transfer pump operation should be manually lifted or lowered periodically to verify proper operation.

8.11 Water Transfer Tank Transfer Pump

The Goulds® centrifugal transfer pump for the water transfer tank does not require a regular maintenance schedule. Should an audible change in operation be detected, the manufacturer should be contacted.

8.12 Flow Totalizer

A Badger Meter model #25 flow meter is located on the discharge line of the Goulds® water transfer tank transfer pump. This flow meter is a nutating disk totalizer used to measure the total number of gallons treated by the Schrader unit. Once a month, the screen from the meter should be removed and cleaned as necessary.

8.13 Flow Meter (See-Flo® Meter)

Preventive maintenance of the flow meter consists of periodic inspection and cleaning. Visually inspect flow meter for missing hardware, loose connections, broken register glass, or other signs of wear or deterioration. Repair or replace components, as necessary. Verify proper flow rate and pressure. A loss in pressure with corresponding decrease in flow rate may indicate that the meter screen is clogged and requires cleaning. Clean dust, dirt, grease, moisture, or other foreign material from exterior of meter and applicable accessory.

Section 9
Routine Monitoring, Record Keeping, and Laboratory Testing of the Light Non-aqueous Phase Liquids Extraction System

The following section describes the routine monitoring and record keeping activities necessary to evaluate the performance of the LNAPL extraction system and to comply with the Industrial Discharge Permit. The activities will help to document and indicate whether the objectives of the LNAPL extraction system are being met. The operator will normally be at the site twice per week during the workweek after startup of the LNAPL extraction system.

9.1 Monitoring Objectives

The objective of the DPE system monitoring is to verify that the system is reducing the area of LNAPL saturation in the northern portion of the site. Verification of system operation will be completed through the monitoring of the following parameters:

- Applied vacuum
- Vapor flow rate
- Liquid volumes collected (water and LNAPL)
- Water levels/LNAPL thickness measurements in the aquifer

To assess the influence and effectiveness of the DPE system, six new 1-inch monitoring points (MP-01 through MP-06) have been installed adjacent to the DPE wells (Appendix A). These points have been installed to monitor water level elevations and measure the induced vacuum in the soils at the well heads in the areas around the DPE wells.

9.2 Monitoring Activities and Schedule

The routine monitoring activities to be performed on the LNAPL extraction system are summarized in Table 9-1. These routine activities include both mechanical checks and routine system monitoring.

Table 9-1
Dual-Phase Extraction System Monitoring Plan

MONITORING PARAMETER	FREQUENCY/SAMPLING TIME AFTER STARTUP	COMMENTS
GROUNDWATER		
Field Measurements LNAPL measurements Water level measurements	Baseline—prior to startup 1 week 2 weeks 3 weeks weekly to biweekly, as needed	Field measurements will be monitored at the following locations: – MW-20B – DPE-04 – MP-02 – MW-20C – DPE-05 – MP-03 – DPE-01 – DPE-06 – MP-04 – DPE-02 – DPE-07 – MP-05 – DPE-03 – MP-01 – MP-06 If steady state conditions develop, monitoring frequency may be modified.
SYSTEM OPERATIONS/SYSTEM EMISSIONS		
Laboratory Analyses VOCs	Startup 1 month 2 months 3 months Monthly as needed	Sampling and analysis for VOCs will be conducted for the following locations: – Influent – Treatment mid-point – Effluent
VAPOR MONITORING POINTS		
Field Measurements Vacuum pressure and flow rate	Baseline – prior to startup Startup-multitude per day Week 1 – Daily Weekly to biweekly thereafter, as needed	Field measurements will be monitored at the following locations: – MP-01 – MP-06 – DPE-04 – MP-02 – DPE-01 – DPE-05 – MP-03 – DPE-02 – DPE-06 – MP-04 – DPE-03 – DPE-07 – MP-05

(1) After 3 months, the sampling program will be reevaluated to evaluate whether the sampling frequency and number of locations should be modified.

9.3 System Monitoring

Operational indicators for the operating equipment will be monitored and recorded on a regular frequency to verify proper operation and to evaluate system performance over time. System monitoring will be conducted multiple times per day during the initial startup, and daily for the first week of operation for optimization of system performance. The system will then be monitored on a weekly to biweekly schedule for the remainder of operation. Monitoring will also include system operating pressures and temperature. Air emission samples (influent, effluent, and between carbon vessels) will be collected weekly for the first month to assess the effectiveness of the system's carbon treatment units. Samples will then be collected on a monthly basis from each of these locations. A removal efficiency of 95 percent is required to achieve compliance. Table 9-1 provides a summary of the DPE system monitoring schedule.

9.4 Vapor Monitoring Point Monitoring

The vacuum at the recovery well head will be maintained, as much as possible, as a constant, and the induced vacuum on the surrounding subsoil will be evaluated as a function of measured soil pore pressure at the monitoring points. Vacuum measurements will be collected frequently at startup, daily for the first week of operation, and weekly to biweekly for the remainder of system operation, to monitor radius of influence around the DPE wells. The vacuum monitoring will provide measurement of the area of influence generated by the DPE wells.

9.5 Groundwater Level Monitoring

Groundwater /LNAPL thickness measurements will be collected and recorded prior to system startup and then weekly to biweekly from the seven DPE wells (DPE-01 through DPE-07), the six new 1-inch monitoring points (MP-01 through MP-06), and monitoring wells MW-20B and MW-20C. Water level elevations/LNAPL thickness measurements will allow for optimal placement of the "stinger pipe" within the well, assuring the collection of any free-phase product, while minimizing the collection of groundwater.

Section 10
Health and Safety

RMT developed a risk analysis/health and safety plan (RA/HSP) for the site in February 2003. The RA/HSP is updated as needed to reflect site changes. By reference, this O&M manual incorporates the RA/HSP in its entirety. A copy of the RA/HSP is readily accessible at the site and is located at the groundwater treatment facility office.

The following subsections summarize and outline the most important standard operating safety procedures and controls, emergency safety procedures, equipment, training requirements, medical surveillance, and record keeping requirements for activities conducted at the groundwater treatment facility.

10.1 Standard Operating Safety Procedures and Controls

Some of the major standard operating safety procedures and controls are listed below. Refer to the latest revision of RMT's RA/HSP for a full listing of operating safety procedures for work at the site.

10.1.1 Environmental Monitoring

- For surface/intrusive work associated with various wells, borings, and other activities such as earthwork and grading, trenching, and underground pipe laying, organic vapor readings will be made using either a Foxboro OVA (Model 128), an HNu Photoionization Analyzer (Model PF101), or a Photovac Microtip.
- A periodic (weekly, monthly) monitoring of equipment seals, fittings, and well heads should be made to determine if system leaks are occurring. The monitoring should be performed visually and with either a Foxboro OVA (Model 128), an HNu Photoionization Analyzer (Model PF101), or a Photovac Microtip.

10.1.2 Personal Protective Equipment

- Personal protective equipment (PPE) to be worn at the site during operation includes safety glasses, steel-toed work boots, and work gloves. Hard hats will be required when working in areas where overhead hazards exist.
- During sampling activities of soils, sediments, or groundwaters, additional PPE may include neoprene, nitrile or heavy duty PVC steel-toed boots, Tyvek® suits, nitrile or neoprene gloves, and as necessary (if monitoring indicates a need), a full face respirator with organic vapor cartridges, and hearing protection.

- It is not expected that respiratory protection equipment will be required during normal operations.
- Site security shall be maintained to prevent potential vandalism and accidents by others. Any process equipment that is not in operation shall be locked out to help prevent operation by unfamiliar or unauthorized operators. The fencing and gates should be visually inspected for damage or vandalism that may affect the integrity of the remediation system.

10.1.3 Personal Precautions

- Read and understand all standard operating safety procedures and adhere to the instructions and requirements outlined in the RA/HSP.
- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of hazardous materials is prohibited in any contaminated or potentially contaminated area.
- Contact lenses shall not be worn in any contaminated area or in any area where safety glasses or respiratory protection are required.
- Hands and face must be thoroughly washed upon leaving the work area. Whenever decontamination procedures for outer garments are required, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- No facial hair (even beard stubble) that interferes with a satisfactory respirator mask-to-face-seal is allowed on personnel required to wear respirators.
- Avoid contact with contaminated or suspected contaminated surfaces. Whenever possible, avoid wading through puddles, pools, mud, etc. Avoid kneeling or sitting on the ground, equipment, or drums.
- Personal articles shall be prohibited in any contaminated area.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel during site operations where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Do not work when ill.
- Identify potential health and safety hazards and contact the appropriate person to initiate corrective action.

10.1.4 Operational Requirements

- Personnel visiting the site shall be adequately trained and thoroughly briefed on anticipated hazards, equipment to be worn, safety practices to be followed, emergency procedures, and communications prior to working at the site. For site workers who are reasonably expected to encounter exposure hazards, this training entails 40-hour health and safety training along with current refresher training.

This training is not required for workers not expected to encounter potential exposure hazards. Lockout/tagout training must be received by applicable individuals.

- Respiratory protection devices and/or protective clothing appropriate for the task at hand shall be worn by all personnel entering areas designated for wearing protective equipment. A protection level of D is expected around the treatment system during normal operation. More stringent levels of protection may be required if conditions so warrant (*i.e.*, high VOC air concentrations).
- As much as possible, workers at the site should use the buddy system. If RMT personnel are working alone, every effort shall be made to use the buddy system with other employees at the site.
- The following warning signals shall be used when necessary:

SIGNAL	WARNING
Hand gripping throat	Can't breathe
Grip partner's wrist or both hands at waist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK, I am all right, I understand
Thumbs down	No, negative

- Communications shall be maintained between field team members at all times. A permanent telephone is located at the Columbia Manufacturing office building to facilitate emergency response communications.
- Decontamination procedures for leaving a contaminated area shall be established and followed as appropriate. Hands and face shall be washed prior to work breaks and eating. Work areas and decontamination procedures have been established based on expected site conditions (see Section 10 of RMT's RA/HSP).
- Confined Space Entry - Several areas in the groundwater treatment plant meet the definition of a confined space. Confined spaces are further classified into permit-required or non-permit required based on the configuration of the space and conditions within the space. The area of concern at the plant is listed below with the appropriate procedures for entering.
    - ***Storage Tanks*** - The water storage tanks are classified as a permit-required confined space and shall not be entered except after consultation with the health and safety coordinator and the completion of the proper permits. Entry into any confined space also requires appropriate employee training.

- Equipment Lockout - For all activities involving servicing or maintaining on-site equipment (*e.g.*, pumps, air handling systems), all energy sources shall be locked out prior to initiation of any maintenance work. The lockout procedure will consist of the following steps:
  - ***Identify*** - All energy sources will be identified. Electrical energy to mechanical equipment is expected to be the sole relevant energy source for this system.
  - ***Lockout/Tagout*** - All energy sources will be locked and tagged using special locks and tags specifically for that purpose. A tag must be used with the lock. The tag must be completely filled out. For work involving more than one individual, group lockouts are provided.
  - ***Try*** - Where possible, restarting of equipment will be attempted using on/off switches or similar devices.
  - ***Notify*** - All affected individuals will be alerted to the use of lockout devices.

All individuals performing energy control functions shall be appropriately trained by the health and safety coordinator (HSC).

- Safety Inspection Checklist - A monthly safety inspection shall be conducted. This inspection shall be documented using Table 10-1. Inspection forms are to be maintained in project files for at least 1 year.

10.2 System Failure Activities

Preventing accidents is the responsibility of each individual at the site. Unsafe or dangerous working conditions shall be reported immediately to the site health and safety representative and the project manager. The project health and safety representative and project manager will be responsible for seeing that the health and safety program is properly implemented.

All contractors and subcontractors shall be responsible for instructing their workers in safe work practices and emergency procedures. This is an important duty and responsibility for each of the contractor(s) and subcontractor(s). RMT's RA/HSP, which has been written specifically to cover only those hazards expected to be encountered by RMT employees, will be made available to all contractor(s) and subcontractor(s) for their review and information. Each contractor and subcontractor is responsible for developing and implementing their own site RA/HSP.

The system operator(s) shall be familiar with the RMT RA/HSP and its contents. The RMT RA/HSP describes the hazard assessment of the chemical constituents that could potentially be encountered, as well as emergency procedures and telephone numbers.

Table 10-1
Monthly Safety Inspection Checklist for the Plant Site

CATEGORY	(✓)	BY/DATE
Fire Extinguisher(s) – Charge O.K.		
Personal Protective Equipment – Hearing Protection - 12 sets available, NRR 27+		
– Splash Goggles - 2 pairs available at the site		
Electrical System – Locks and tags available		
– Outdoor overhead system clear of interferences		
Ladders – Available and in good working order		
Housekeeping – Floor clean and dry		
– Orderly, no trip hazards		
– No trash around site		
Combustibles		
– Lubrication oil properly stored		
Comments:		
Operator in Charge Signature		Date:

Distribution: Project File 998.81
Project Manager
Safety Coordinator
Operator in Charge

10.2.1 Medical Emergencies

For physical injuries, first aid treatment shall be given at the site, depending upon the seriousness of the injury. The victim should undergo decontamination, if necessary, unless such procedures interfere with necessary treatment. ***In life-threatening situations,*** care shall be instituted immediately. Always remove respirators. Protective clothing shall be removed or cut away if this will not cause delays, interfere with treatment, or aggravate the problem. If contaminated protective clothing cannot be removed, wrap the victim in clean materials. Chemical exposures are unlikely during normal system operations and are more associated with intrusive investigations that may be conducted at the MTD-Westfield site.

Emergency equipment maintained at the site shall include the following:

- First aid kit with a bloodborne pathogen kit
- Full face respirators – high-efficiency particulate air (HEPA)/organic vapor combination cartridges (GMA-H or GMC-H) - personnel shall bring these to the site, as needed
- Field telephone
- Fire extinguisher (10 lb. ABC)
- Splash goggles (at least two pairs)
- Hearing protection (at least 12 pairs of >NRR 27 earplugs)
- Portable eyewash

In the event of injury, the emergency shall be handled according to the procedures described in the emergency procedures noted in the health and safety manual. A first aid kit shall be maintained at the site at all times.

Appropriate decontamination of all clothing and equipment shall be followed, if necessary.

10.2.2 General Emergency Procedures

- In the event that a member of the field crew experiences any adverse effects or symptoms of exposure while on the scene, the entire field crew shall immediately halt work and act according to the instructions provided by the health and safety representative.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated shall result in the evacuation of the field team and reevaluation of the hazard and the level of protection required.

- In the event that a member of the field crew experiences any adverse effects or symptoms of exposure while at the site, the entire field crew shall immediately halt work and act according to the instructions provided by the site health and safety representative. Follow-up action shall be taken to correct the situation that caused the accident. The health and safety representative shall then complete an incident report.
- Solid materials that are spilled will be scooped up, placed in appropriate containers, and held for disposal. Spilled liquids will be neutralized or containerized and held for disposal. Prior to spill clean up, the HSC will be consulted to confirm that employees are protected during that work.

10.2.3 Personal Injury

Site personnel will be trained in American Red Cross first aid/CPR procedures and shall administer appropriate first aid treatment in emergency situations. The following general emergency procedures shall be followed ***in the event of injury***:

1. Notify the health and safety representative of the incident.
2. If the victim can be moved safely, remove him/her from the contaminated zone to the decontamination zone using established control points.
3. Administer first aid.
4. Transport victim to nearest hospital or emergency medical center ***or*** call for ambulance transport, as appropriate.

   Note: The health and safety representative shall direct the removal of injured personnel from the contaminated zone and shall approve any necessary deviation from established decontamination procedures. Such deviation shall be based upon the severity or life threatening nature of the injury.
5. Notify the HSC of the incident, and describe the emergency response actions taken. A follow-up written report will be provided to the HSC and the project manager.

10.2.4 Chemical Exposure

Before entering a contaminated zone, all site personnel shall be thoroughly acquainted with the types of toxic/hazardous chemicals present at the site and their potential concentrations. The following general procedures shall be followed for ***chemical exposure emergencies***:

1. Move the victim from the immediate area of exposure/contamination, taking precautions to prevent additional exposure of other individuals.
2. Notify the health and safety representative of the exposure incident.
3. Decontaminate clothing or remove clothing if safe to do so.

For skin or eye contact, thoroughly wash affected areas with water.

For inhalation exposure, ensure that victim has adequate fresh air.

4. Administer additional first aid treatment as appropriate.
5. Transport victim to nearest hospital or emergency medical center ***or*** call for ambulance transport as appropriate.

   Note: The site health and safety representative shall direct the removal of injured personnel from the contaminated zone and shall approve any necessary deviation from established decontamination procedures. Such deviation shall be based upon the security or life threatening nature of the injury.
6. Notify the HSC of the incident and describe the emergency response actions taken.

10.2.5 Fire or Explosion

In the event of a fire or explosion:

1. Immediately evacuate injured personnel and leave the area.
2. Administer first aid as appropriate.
3. Notify emergency services.
4. Notify the HSC.

10.2.6 Emergency Contacts

The appropriate contact(s) from the following list shall be made for all emergency situations.

EMERGENCY SERVICE	TELEPHONE
Fire Department	911
EMS	911
Police	911/413-568-6285
Hampden County Sheriff	413/547-8000, Ext. 2101
Noble Hospital	911/413-568-2811
Poison Control Center	1-800-222-1222
RMT Corporate Health and Safety Manager	864/234-9431 (office) 864/525-7326 (cell)

Note: For ambulance, fire or police contacts, give the name of the road and the nearest intersection. The portable telephone at the site will be used for emergency notifications. Figure 10-1 is the Emergency Route Map.

After contacting emergency services, the HSC and project manager will be notified.

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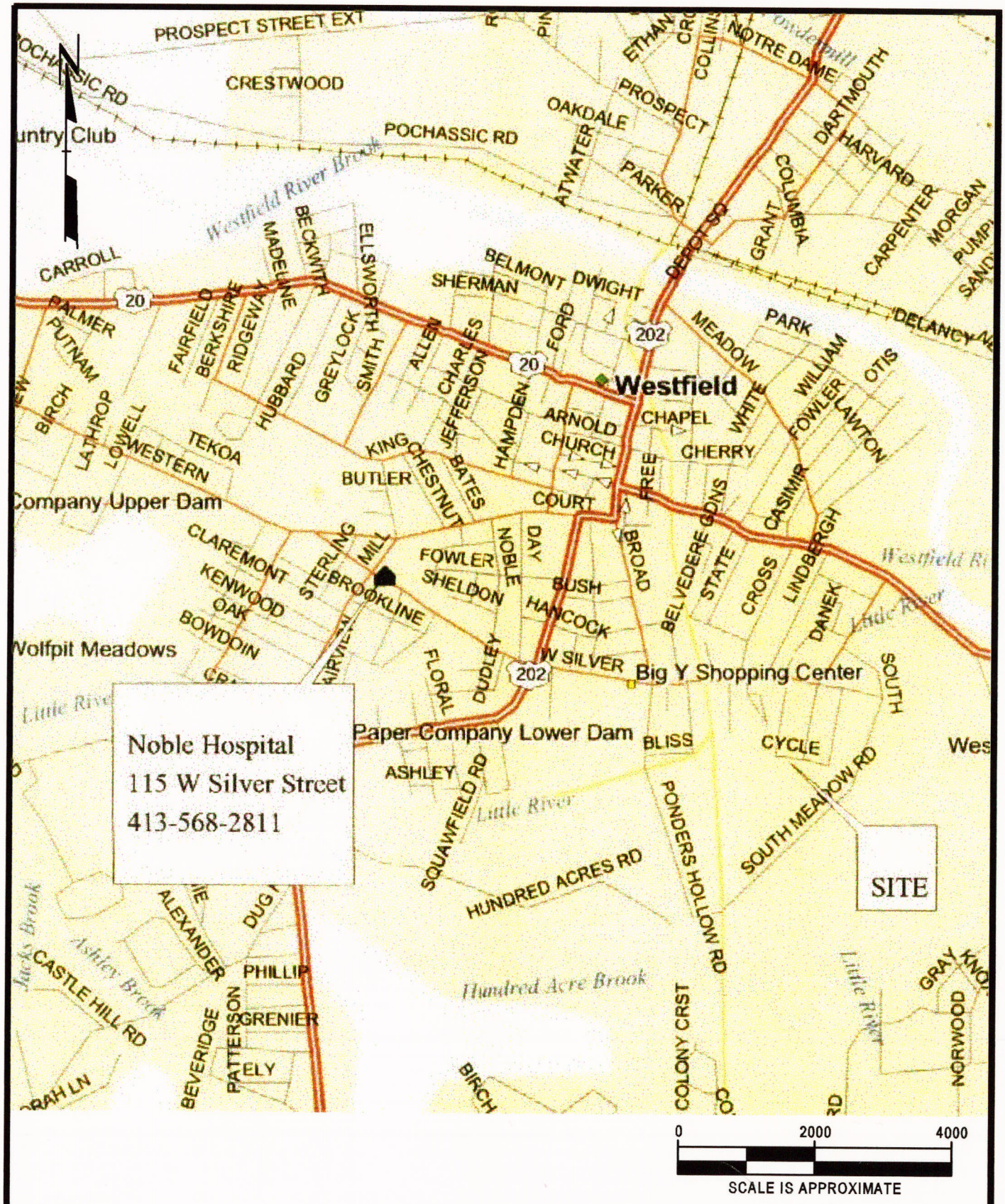

RMT INC.	MTD PRODUCTS COLUMBIA MANUFACTURING FACILITY WESTFIELD, MASSACHUSETTS	DRAWN BY: AHS APPROVED BY: SDS PROJECT NO. 998.81 FILE NO. SPG-00.998.81-001.DGN DATE: JULY 2003
	EMERGENCY ROUTE MAP	

FIGURE 10-1

Section 11
References

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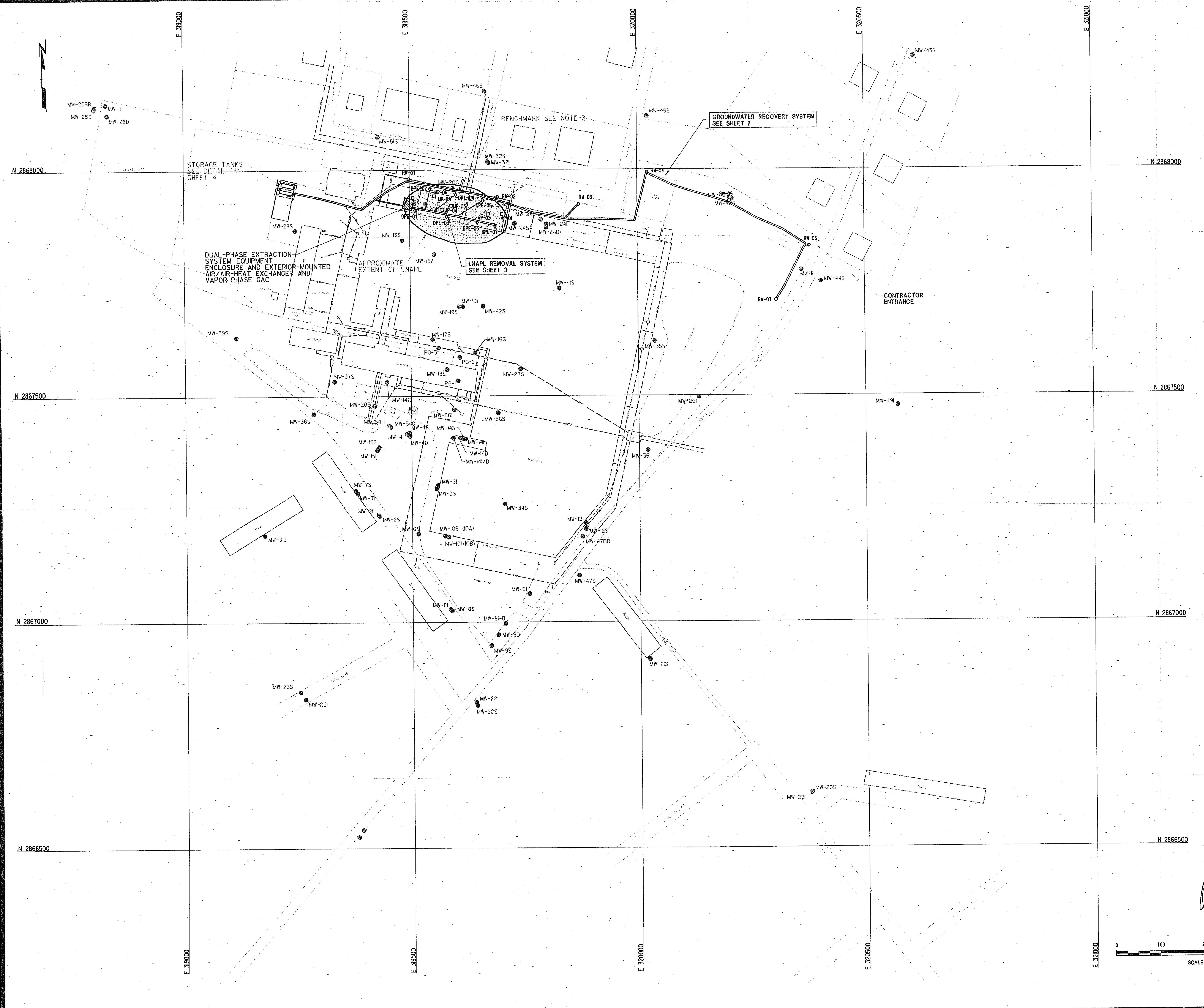
RMT, Inc. March 2003. *LNAPL Extraction and Property Line Migration Control System Equipment Literature Manual*. Columbia Manufacturing Facility. Westfield, Massachusetts.

Schrader Environmental Services, Inc. December 10, 2002. *SES Dual Phase Extraction Environmental Treatment System Operation and Maintenance Manual*. Columbia Manufacturing Facility. Westfield, Massachusetts.

Appendix A
Drawings



LEGEND

	EXISTING	NEW
BUILDING		
POWER POLE (LIGHT POLE)		
FIBER-OPTIC CABLE	FOC	
STORM DRAIN LINE	SD	
SANITARY SEWER LINE	SS	
FIRE PROTECTION LINE	FP	
GAS LINE	G	
GROUNDWATER RECOVERY WELL		RW-2
DUAL-PHASE VACUUM EXTRACTION WELL		DPE-01
MONITORING WELL	MW-44S	
OBSERVATION WELL		OW-03
MONITORING POINT		MP-06
GRATE INLET		
ASPHALT		
CHAIN LINK FENCE		
MANHOLE		

NOTES

1. EXISTING SITE FEATURES AND UNDERGROUND UTILITY LOCATIONS WERE TAKEN FROM DRAWINGS MADE BY LANCY LABORATORIES INC. DATED MAY 5, 1970 AND FACTORY MUTUAL ENGINEERING DIVISION, NORWOOD, MASSACHUSETTS DATED JUNE 6, 1974.
2. COORDINATES ARE IN FEET AND ARE BASED ON THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, NAD83.
3. ELEVATIONS ARE IN FEET AND ARE BASED ON THE CITY OF WESTFIELD DPW DATUM. BENCHMARK IS SOUTHWEST CORNER OF CONCRETE PAD FOR SEWER MANHOLE ON SOUTH SIDE OF CYCLE STREET OPPOSITE THE INTERSECTION WITH LOZIER AVENUE. ELEVATION = 89.48 FEET.
4. LOCATIONS OF ALL EXISTING UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR SHALL LOCATE ALL ABOVE AND BELOW GRADE UTILITIES PRIOR TO ANY NEW CONSTRUCTION ACTIVITIES AND PROTECT FROM DAMAGE DURING CONSTRUCTION.
5. ALL SOILS GENERATED AS A RESULT OF DRILLING SHALL BE CHARACTERIZED AND DISPOSED OF OFF-SITE.
6. ALL EXISTING ASPHALT PAVING REMOVED DURING TRENCHING AND DRILLING OPERATIONS SHALL BE DISPOSED OF OFF-SITE.
7. FOR TRENCH BACKFILL AND COMPACTION REFER TO DETAIL "E" SHEET 5.
8. NEW ASPHALT PAVING SHALL BE INSTALLED AS PER DETAIL "D" SHEET 5.
9. ALL UNPAVED AREAS THAT ARE DISTURBED DURING CONSTRUCTION SHALL BE FINE GRADED, GRASSED AND MULCHED.

NOTE: SCREENED INFORMATION IS AS DESIGNED, FROM THE CONSTRUCTION PLANS. BOLD INFORMATION IS AS CONSTRUCTED, RECORD DRAWING INFORMATION.

NO.	BY	DATE	REVISION	APP'D.
0	AHS	3-27-03	RECORD DRAWING	SDS
B	DMC	8-9-02	ISSUED FOR AGENCY REVIEW	SDS
A	DMC	7-26-02	ISSUED FOR CLIENT REVIEW	SDS

PROJECT: **MTD PRODUCTS COLUMBIA MANUFACTURING FACILITY WESTFIELD, MASSACHUSETTS**

SHEET TITLE: **OVERALL SITE PLAN**

DRAWN BY: DMC	SCALE: AS NOTED	PROJ. NO. 998.73
CHECKED BY: SDS		FILE NO.
APPROVED BY: SWW	DATE PRINTED:	SHEET 1 OF 7
DATE: APRIL 2003		

CONSULTING ENGINEERS, P.C.
RMT®
100 Verdae Blvd.
Greenville, SC 29607-3825
P.O. Box 16778 29606-6778
Phone: 864-281-0030
Fax: 864-281-0288

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NOTES

1. REFER TO SHEET 1 FOR LEGEND AND GENERAL NOTES.
2. CONTRACTOR TO MAINTAIN 10 FEET SETBACK BETWEEN TRENCHES FOR NEW LINES AND EXISTING MONITORING WELLS (UNLESS APPROVED OTHERWISE BY THE ENGINEER).
3. CONTRACTOR TO USE EXTREME CAUTION DURING TRENCHING OPERATIONS.
4. EXISTING FIBER-OPTIC LINE AND EXISTING GAS LINES ARE NOT TO BE DISTURBED UNDER ANY CIRCUMSTANCES. CONTRACTOR TO COORDINATE CLOSELY WITH LOCAL UTILITY COMPANIES TO ENSURE ADEQUATE PROTECTION OF THESE LINES.
5. HDPE PIPING SHALL BE ASTM D2737-SDR 9 (PE 3408) DRISCOPIPE MUNICIPAL SERVICE TUBING OR EQUAL.

0 40 80 120 160
SCALE: 1"= 40'

NOTE: SCREENED INFORMATION IS AS DESIGNED, FROM THE CONSTRUCTION PLANS. BOLD INFORMATION IS AS CONSTRUCTED, RECORD DRAWING INFORMATION.

NO.	BY	DATE	REVISION	APP'D.
0	AHS	3-27-03	RECORD DRAWING	SDS
B	DMC	8-9-02	ISSUED FOR AGENCY REVIEW	SDS
A	DMC	7-26-02	ISSUED FOR CLIENT REVIEW	SDS

PROJECT: **MTD PRODUCTS COLUMBIA MANUFACTURING FACILITY WESTFIELD, MASSACHUSETTS**

SHEET TITLE: **GROUNDWATER RECOVERY SYSTEM SITE PLAN**

DRAWN BY: DMC	SCALE: AS NOTED	PROJ. NO. 998.73
CHECKED BY: SDS		FILE NO.
APPROVED BY: SWW	DATE PRINTED:	SHEET 2 OF 7
DATE: APRIL 2003		

CONSULTING ENGINEERS, P.C.
RMT
100 Verdae Blvd.
Greenville, SC 29607-3825
P.O. Box 16778 29606-6778
Phone: 864-281-0030
Fax: 864-281-0288

j:/cad/90-998/66/spg-90-998.66-002.dgn

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NOTE: SCREENED INFORMATION IS AS DESIGNED, FROM THE CONSTRUCTION PLANS. BOLD INFORMATION IS AS CONSTRUCTED, RECORD DRAWING INFORMATION.

NOTES

1. REFER TO SHEET 1 FOR LEGEND AND GENERAL NOTES.
2. CONTRACTOR TO MAINTAIN 10 FEET SETBACK BETWEEN TRENCHES FOR NEW LINES AND EXISTING MONITORING WELLS (UNLESS APPROVED OTHERWISE BY THE ENGINEER).
3. CONTRACTOR TO USE EXTREME CAUTION DURING TRENCHING OPERATIONS.
4. EXISTING FIBER-OPTIC LINE AND EXISTING GAS LINES ARE NOT TO BE DISTURBED UNDER ANY CIRCUMSTANCES. CONTRACTOR TO COORDINATE CLOSELY WITH LOCAL UTILITY COMPANIES TO ENSURE ADEQUATE PROTECTION OF THESE LINES.
5. ALL 1½" GALVANIZED STEEL PIPE FOR DUAL-PHASE EXTRACTION SHALL BE SCHEDULE 40. ALL STEEL PIPES HEAT-TRACED AND INSULATED.
6. CONTRACTOR TO CONNECT EFFLUENT LINE FROM DUAL-PHASE EXTRACTION SYSTEM EQUIPMENT ENCLOSURE TO 1" HDPE STUB-UP REFER TO DETAIL "L" SHEET 6.

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PROJECT: **MTD PRODUCTS COLUMBIA MANUFACTURING FACILITY WESTFIELD, MASSACHUSETTS**

SHEET TITLE: **LNAPL REMOVAL SYSTEM SITE PLAN**

DRAWN BY: DMC	SCALE: AS NOTED	PROJ. NO. 998.73
CHECKED BY: SDS		FILE NO.
APPROVED BY: SWW	DATE PRINTED:	SHEET 3 OF 7
DATE: APRIL 2003		

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RMT®
100 Verdae Blvd.
Greenville, SC 29607-3825
P.O. Box 16778 29606-6778
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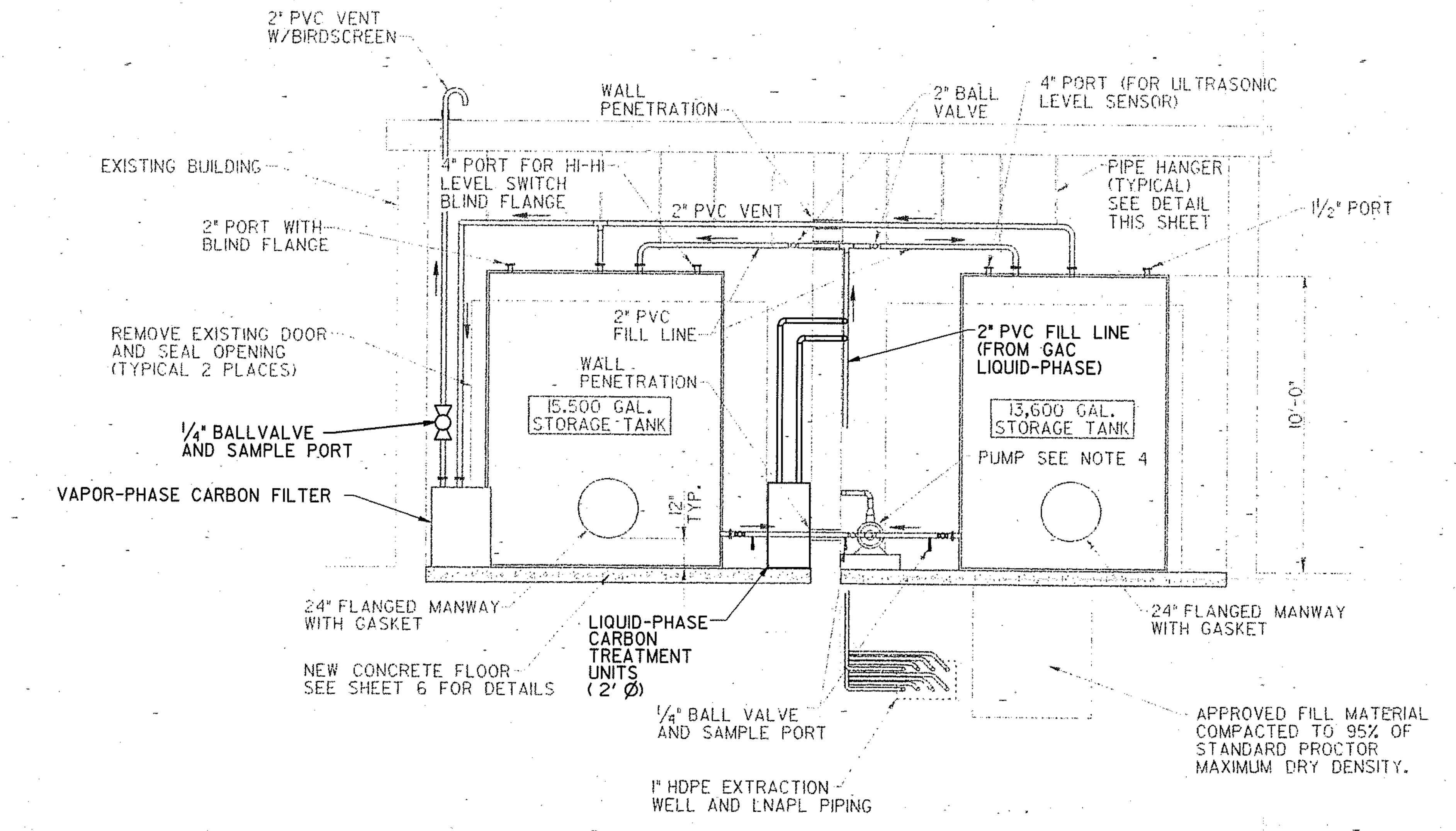
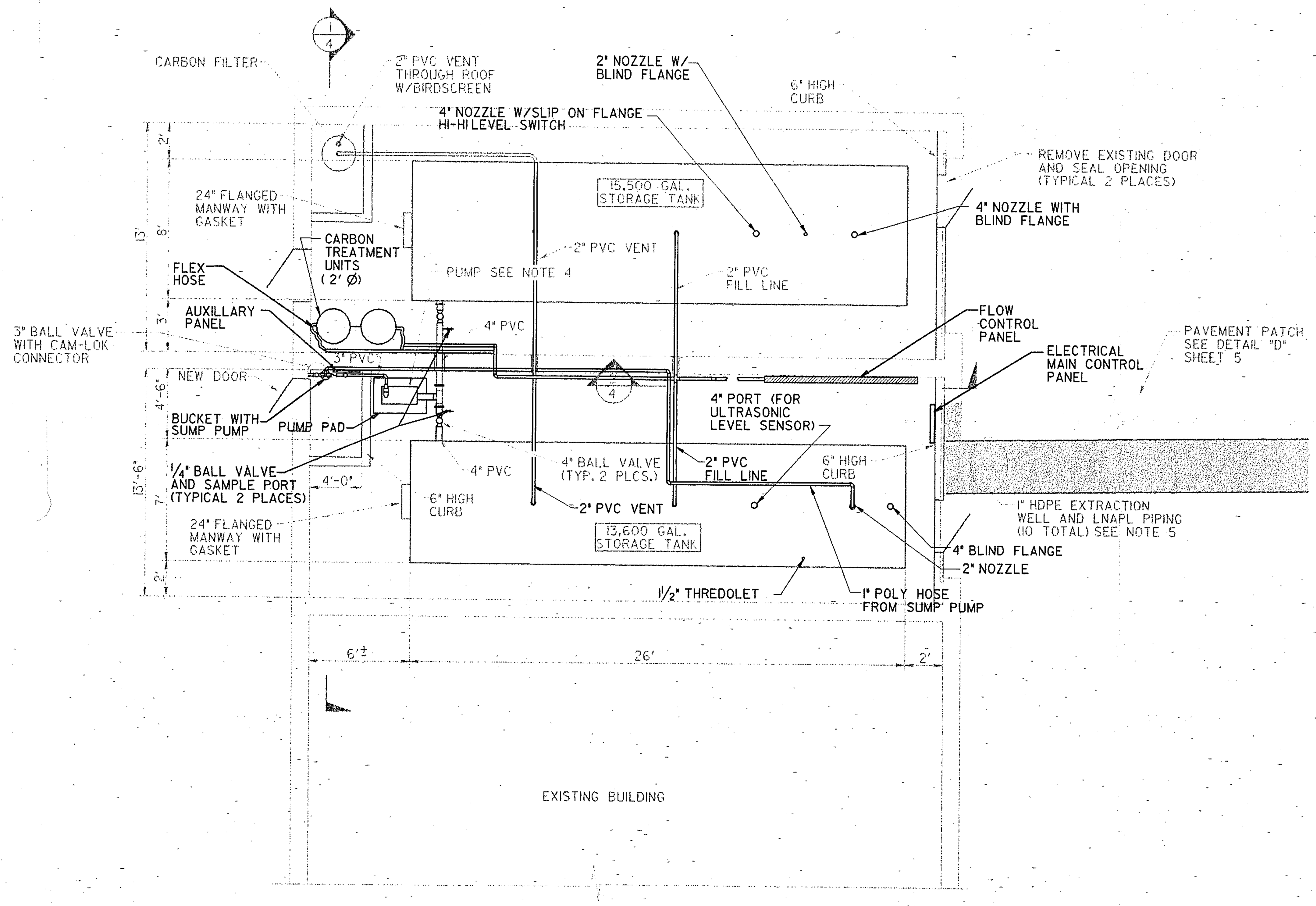


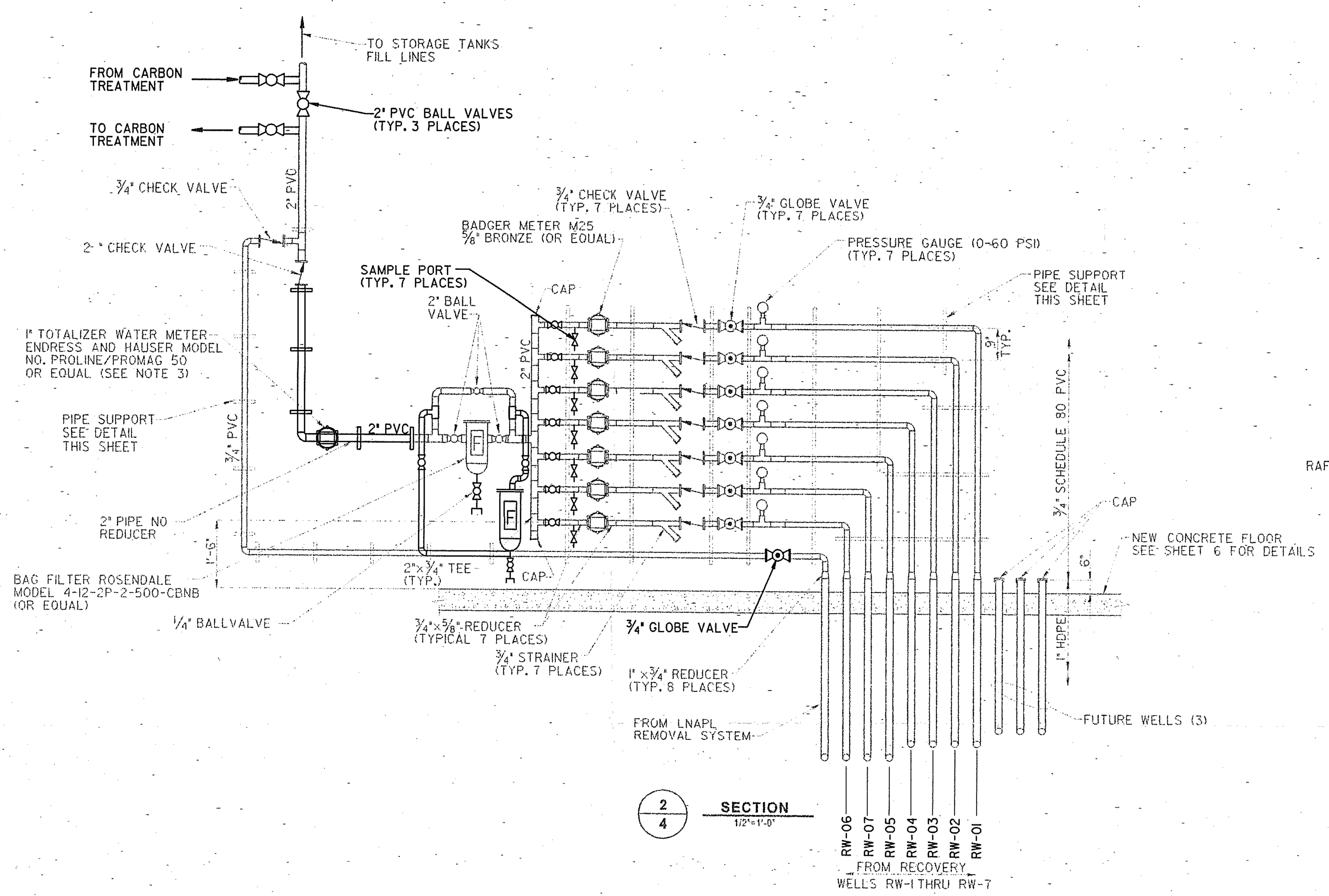
1/4 **SECTION**

1/4"=1'-0"



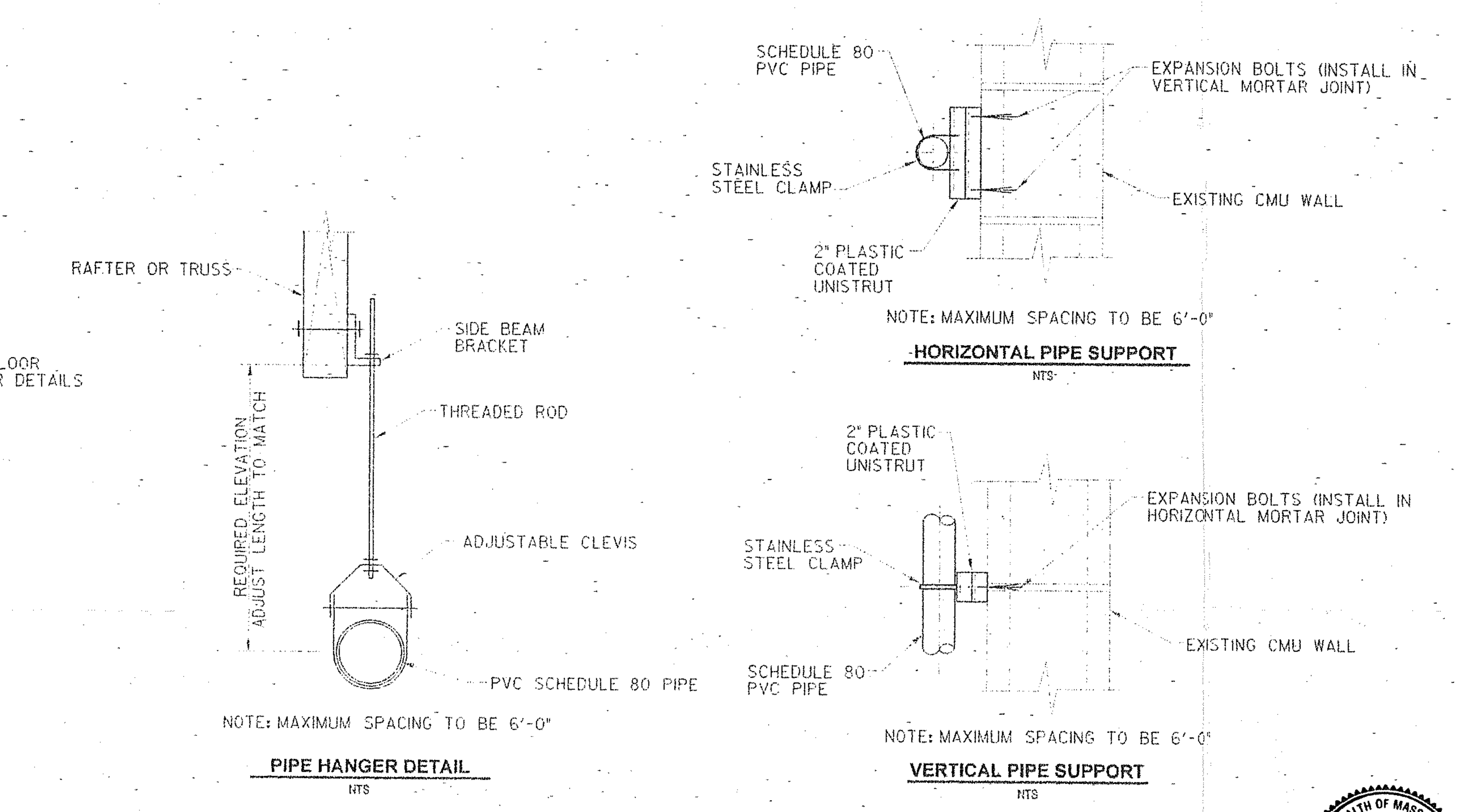
A/4 **ENLARGED PLAN AT STORAGE TANK BUILDING**

1"=5'



2/4 **SECTION**

1/2"=1'-0"



TYPICAL PIPE HANGER AND SUPPORT DETAILS

NTS

NOTES

1. THESE DRAWINGS PROVIDE GENERAL INFORMATION REGARDING THE SIZE, LOCATION, ORIENTATION AND CONNECTIONS FOR THE WATER STORAGE TANKS. FINAL TANK FABRICATION DETAILS SHALL BE PROVIDED IN ENGINEER APPROVED MANUFACTURER'S SHOP DRAWINGS.
2. CONTRACTOR SHALL USE APPROVED SHOP DRAWINGS AS THE BASIS FOR ESTABLISHING FINAL LOCATIONS AND ELEVATIONS FOR PIPING AND OTHER BUILDING FEATURES. CONTRACTOR SHALL OBTAIN ENGINEER'S APPROVAL OF PROPOSED BUILDING PLAN PRIOR TO PROCEEDING.
3. PROVIDE A MINIMUM OF 10" INCHES OF STRAIGHT PIPE UPSTREAM AND 5' OF STRAIGHT PIPE DOWNSTREAM AT WATER METER.
4. WATER STORAGE TANK DISCHARGE PUMP SHALL BE GUSHER PUMP MODEL 3x4x8B-SEH-CC-ACL ALLCAST IRON, 300 GPM @ 20 ft. TDH, CLOSE-COUPLED, CENTRIFUGAL 4" SUCTION / 3" DISCHARGE 5 HORSEPOWER / 1750 RPM 460/230 VOLT - 3-PHASE 8 AMPS @ 460V) BY INDUSTRIAL & ENVIRONMENTAL SALES, INC., INDIANAPOLIS, INDIANA (OR APPROVED EQUAL)
5. HDPE PIPING SHALL BE ASTM D2737-SDR 9 (PE 3408) DRISCOPIPE MUNICIPAL SERVICE TUBING OR EQUAL.
6. ALL PVC PIPING IN STORAGE TANK BUILDING SHALL BE SCHEDULE 80.

NOTE: SCREENED INFORMATION IS AS DESIGNED, FROM THE CONSTRUCTION PLANS. BOLD INFORMATION IS AS CONSTRUCTED, RECORD DRAWING INFORMATION.

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COMMONWEALTH OF MASSACHUSETTS, DR. STEVE ... ENVIRONMENTAL NO. 42732, REGISTERED PROFESSIONAL ENGINEER

5/30/03

PROJECT: MTD PRODUCTS COLUMBIA MANUFACTURING FACILITY WESTFIELD, MASSACHUSETTS

SHEET TITLE: STORAGE TANKS DETAILS

DRAWN BY: DMC	SCALE: AS NOTED	PROJ. NO. 998.73
CHECKED BY: SDS		FILE NO.
APPROVED BY: SWW	DATE PRINTED:	SHEET 4 OF 7
DATE: APRIL 2003		

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RMT
100 Verdae Blvd. Greenville, SC 29607-3825
P.O. Box 16778 29606-6778
Phone: 864-281-0030
Fax: 864-281-0288

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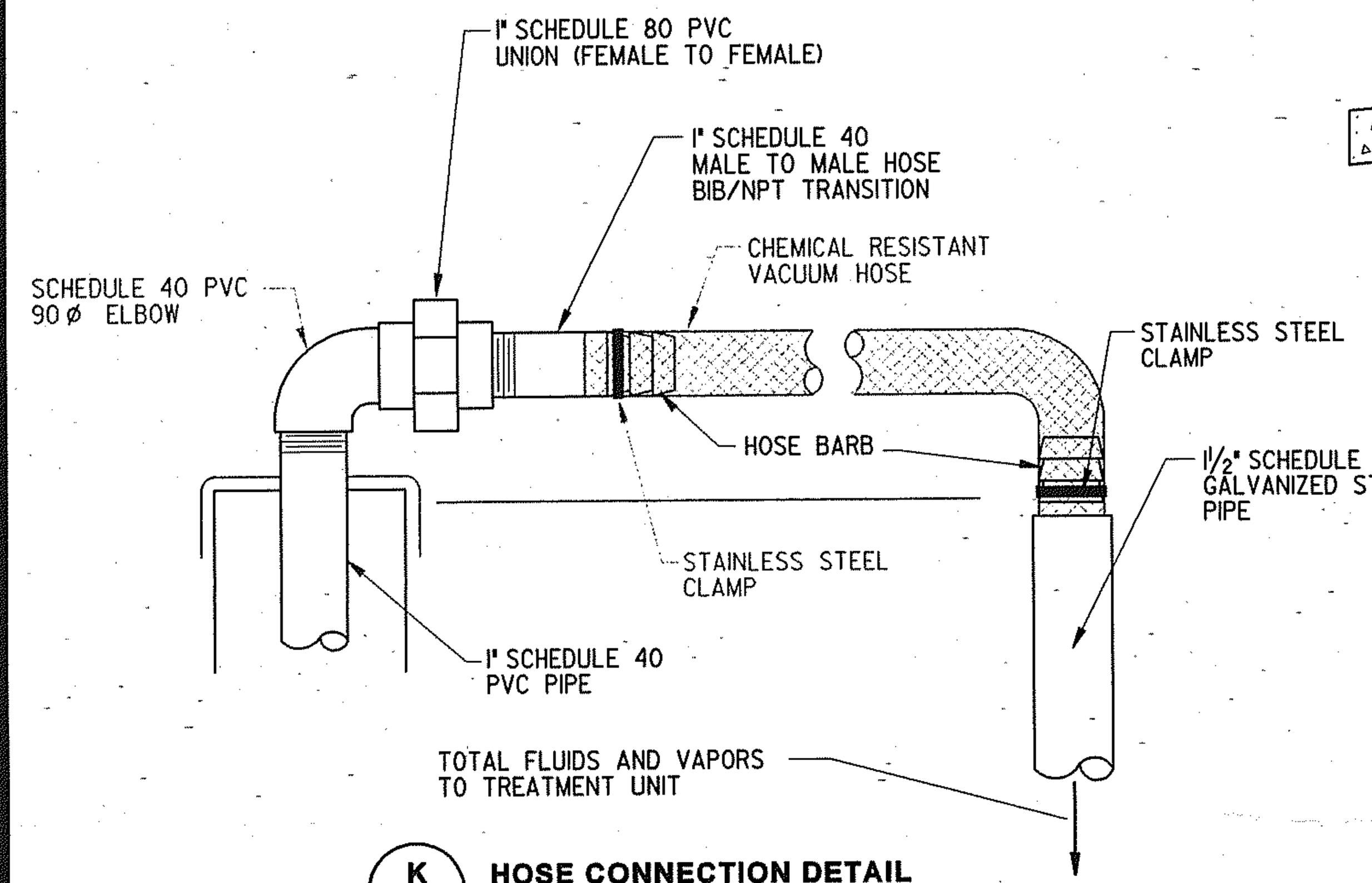
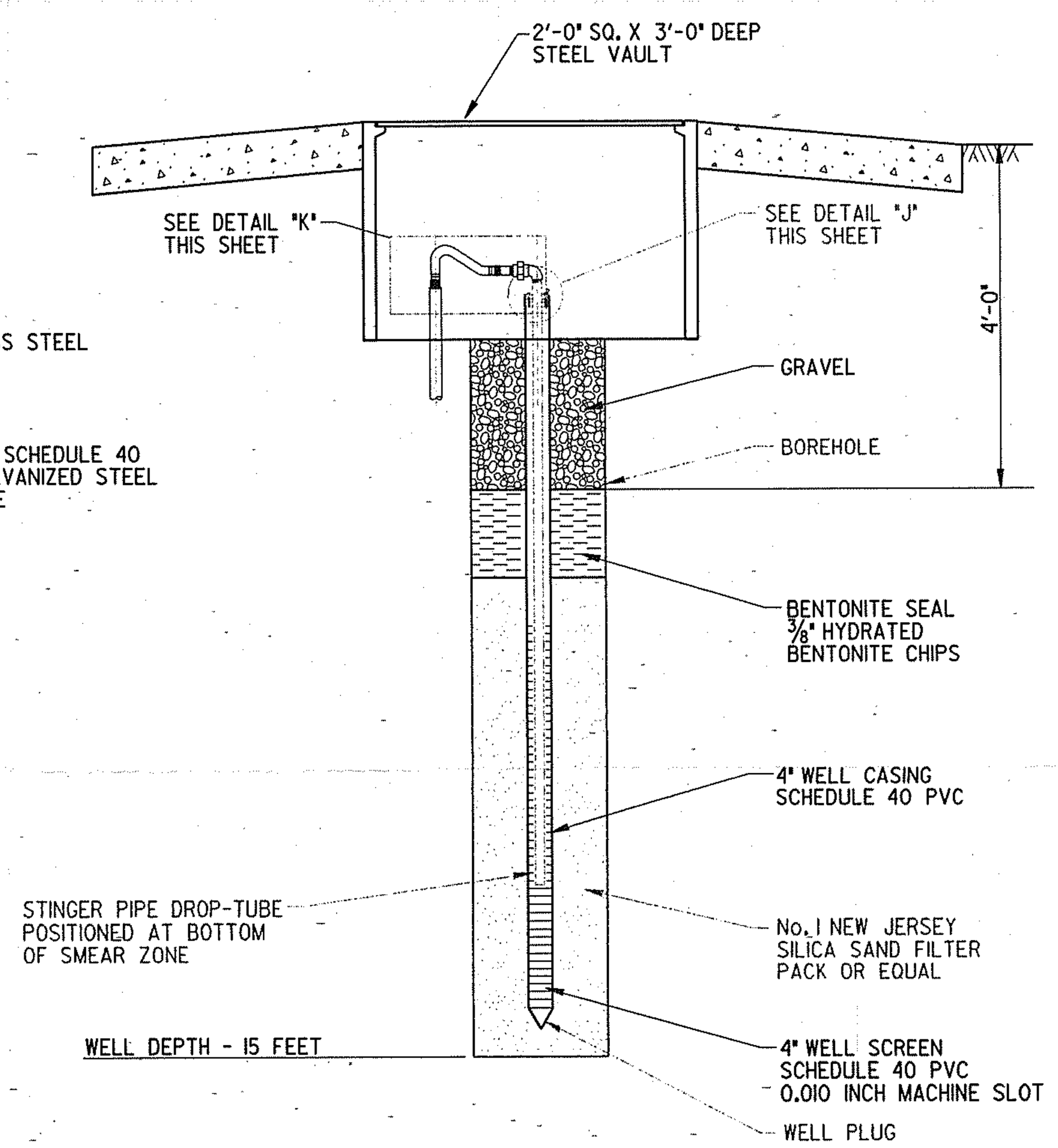
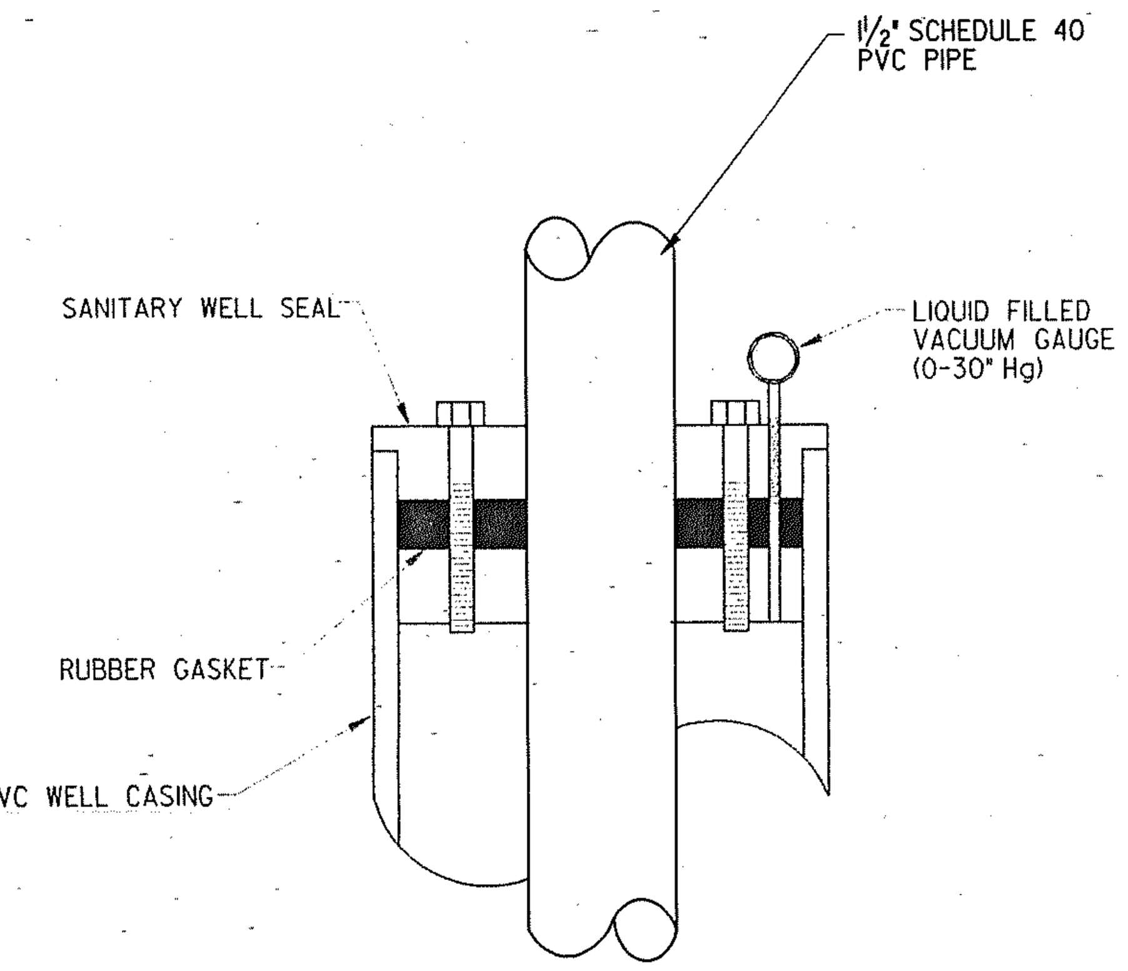


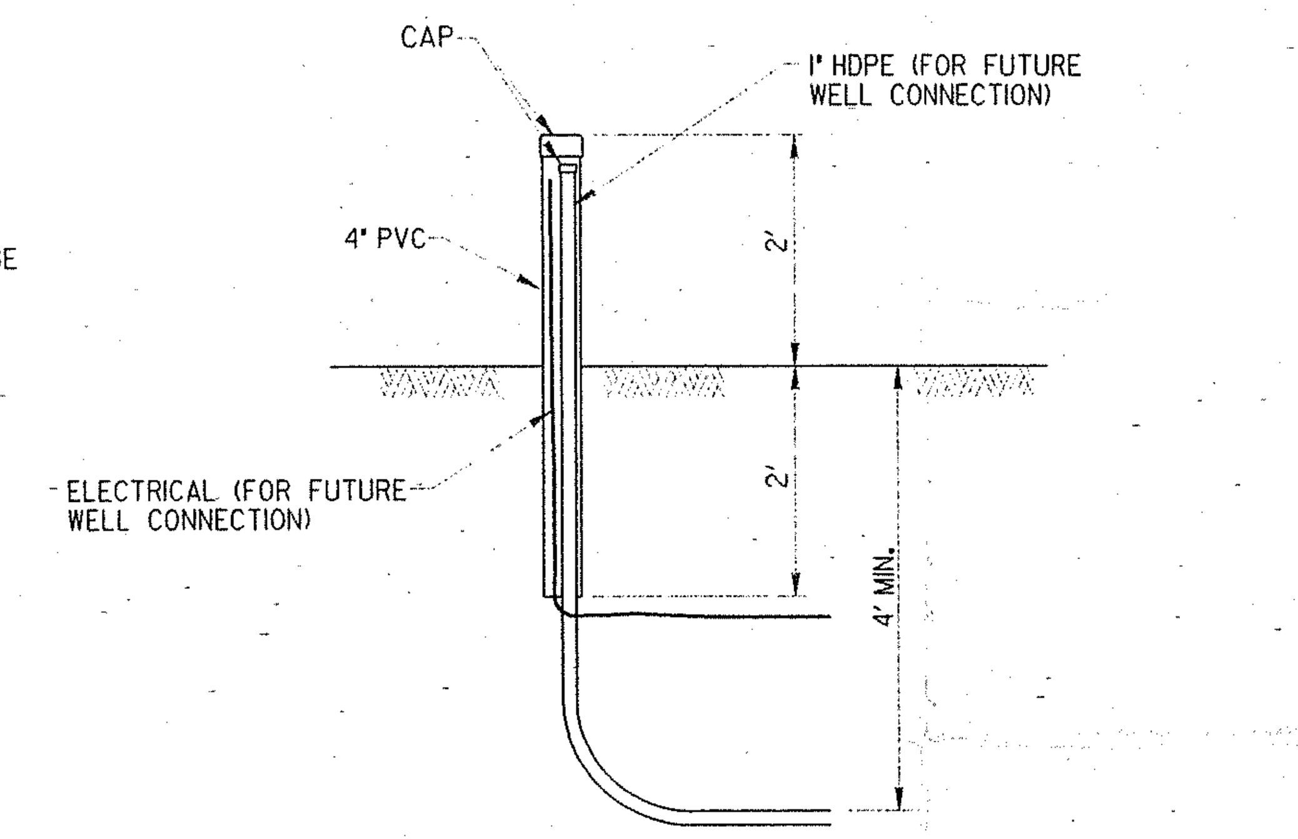
K / 5 **HOSE CONNECTION DETAIL**
NOT TO SCALE



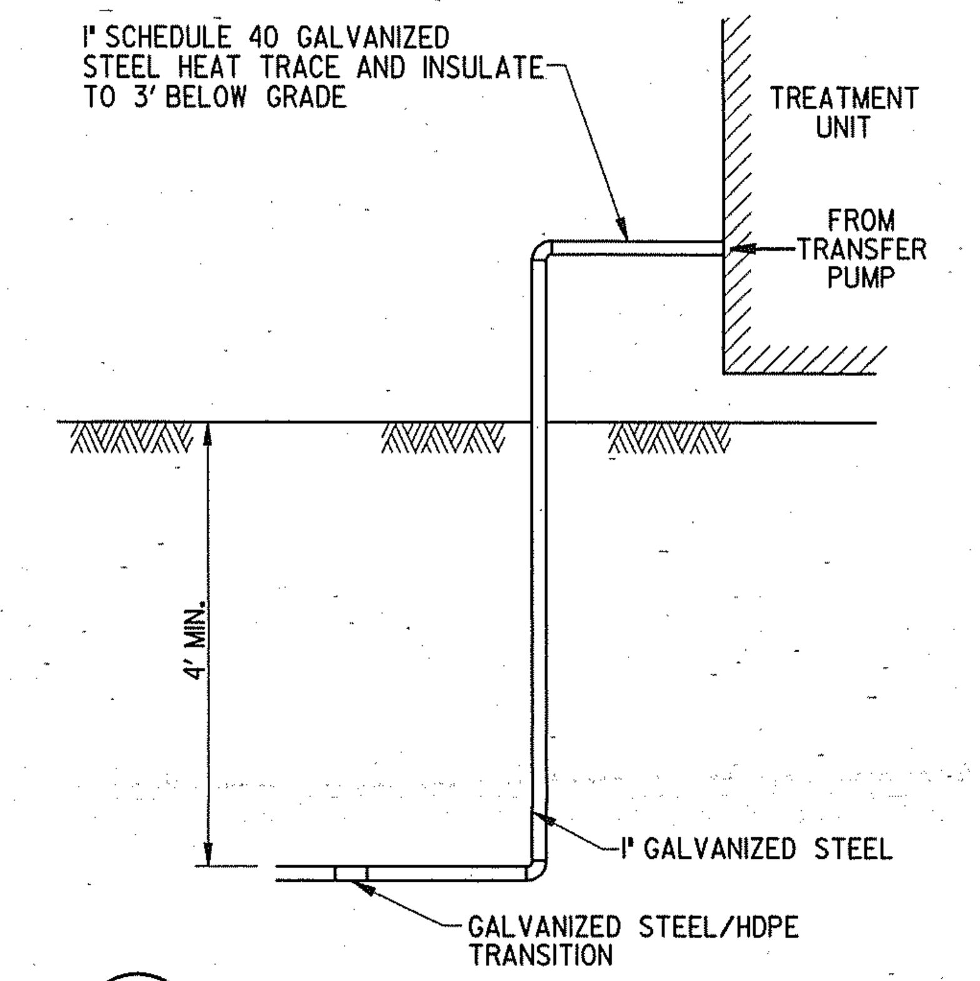
J / 5 **DUAL-PHASE EXTRACTION WELL CONSTRUCTION DIAGRAM**
NOT TO SCALE



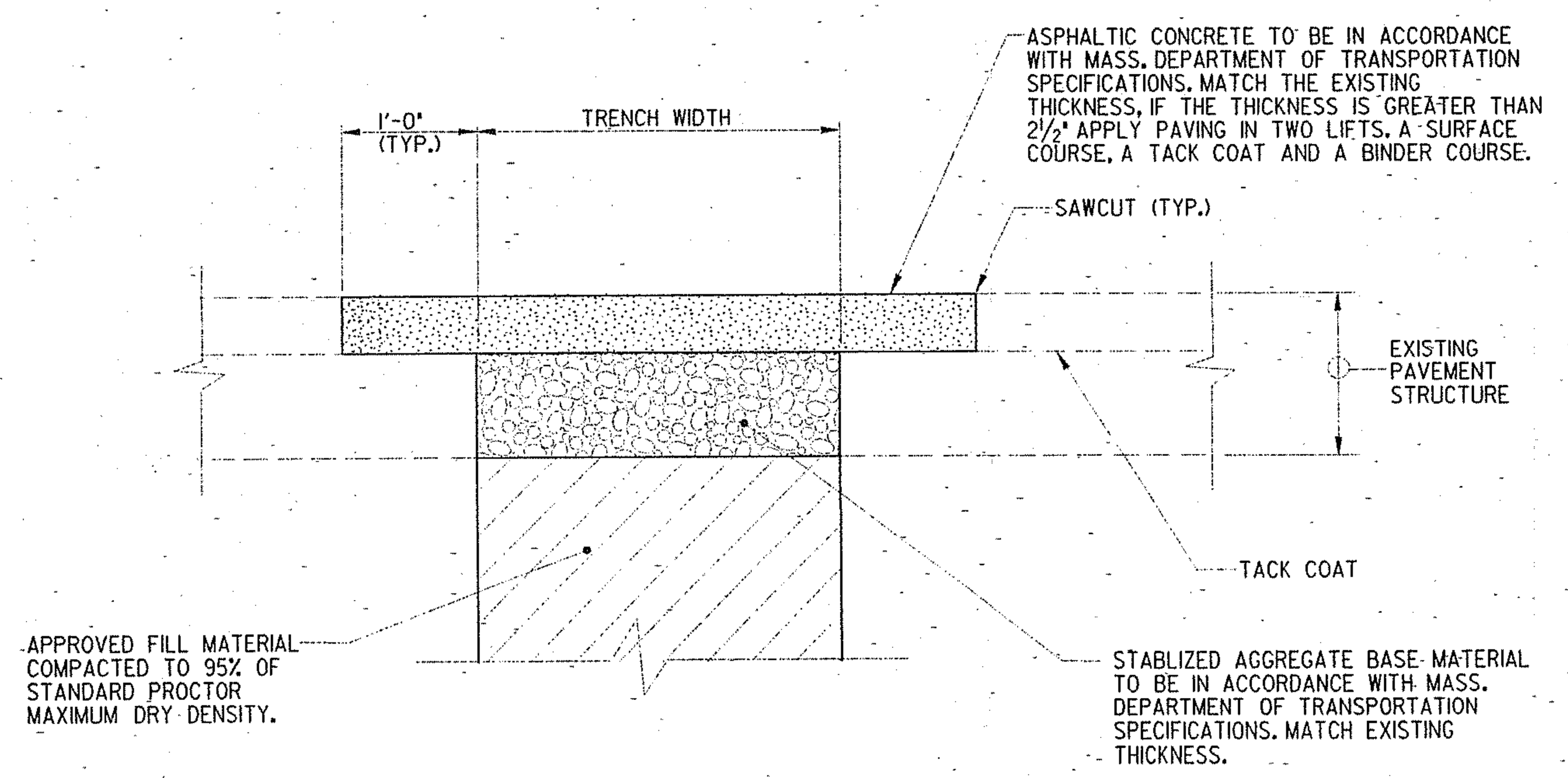
J / 5 **WELL SEAL DETAIL**
NOT TO SCALE



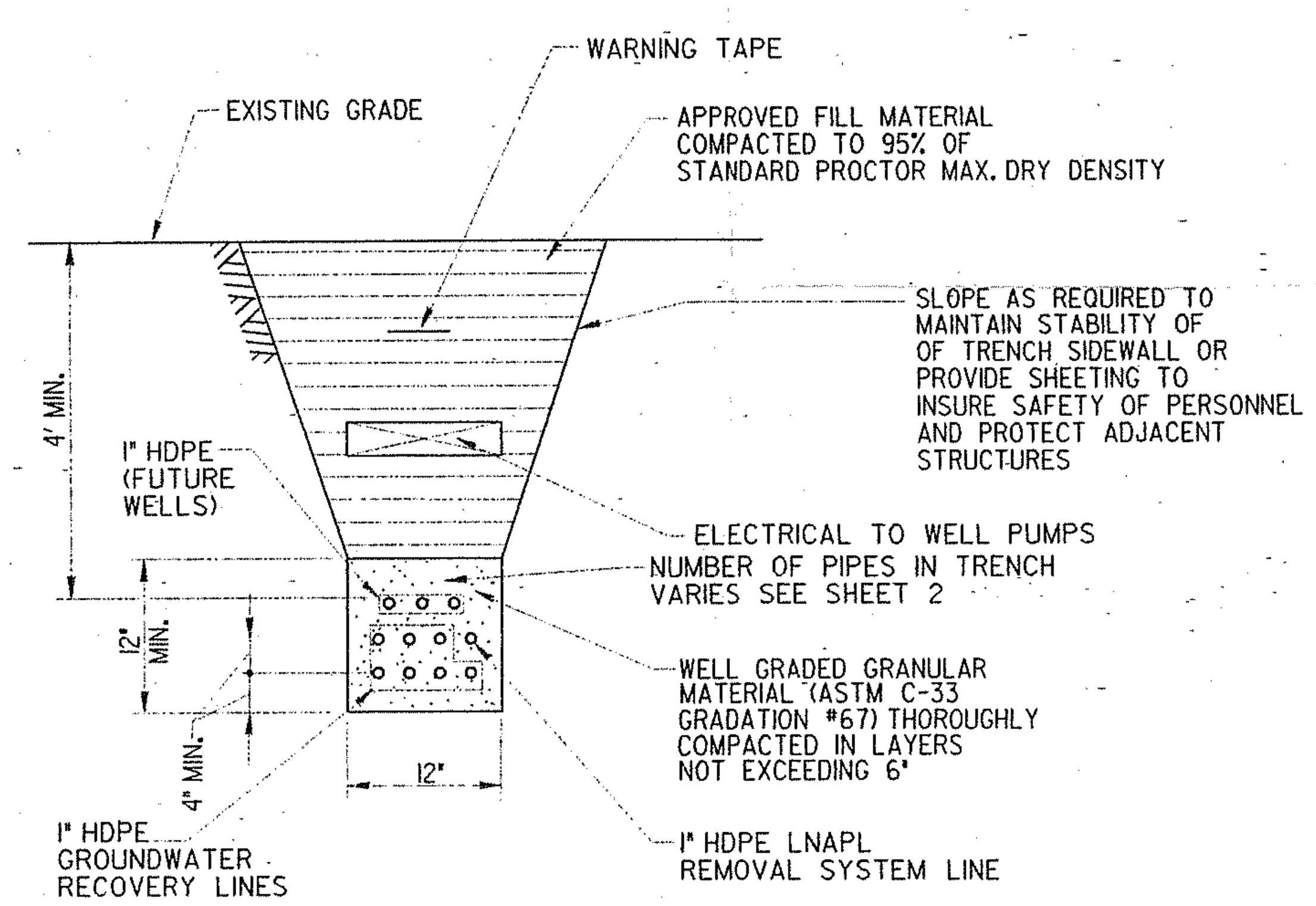
H / 5 **GROUNDWATER EXTRACTION WELL DETAIL (FUTURE STUB-UP)**
NOT TO SCALE



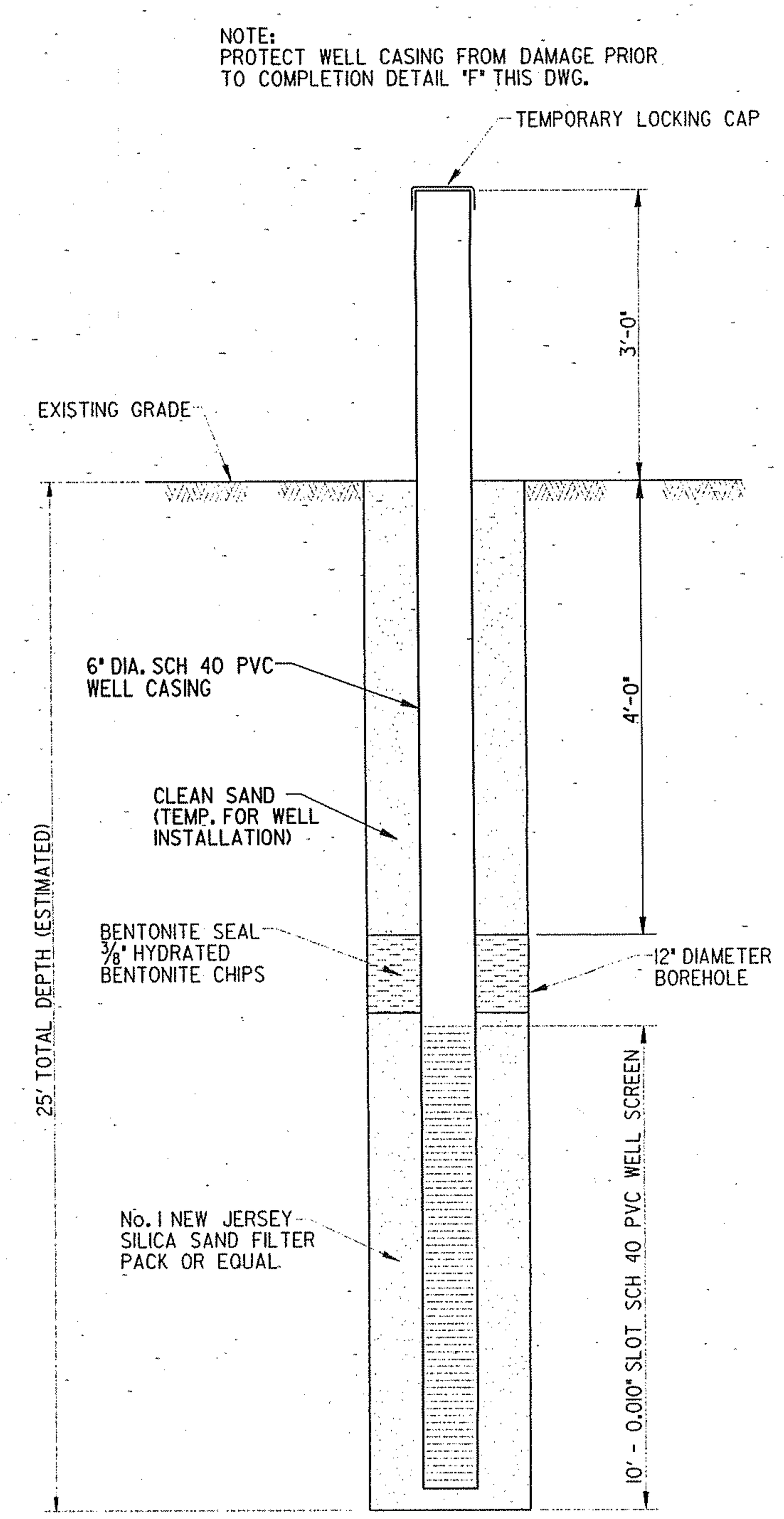
L / 5 **LNAPL PIPE CONNECTION DETAIL**
NOT TO SCALE



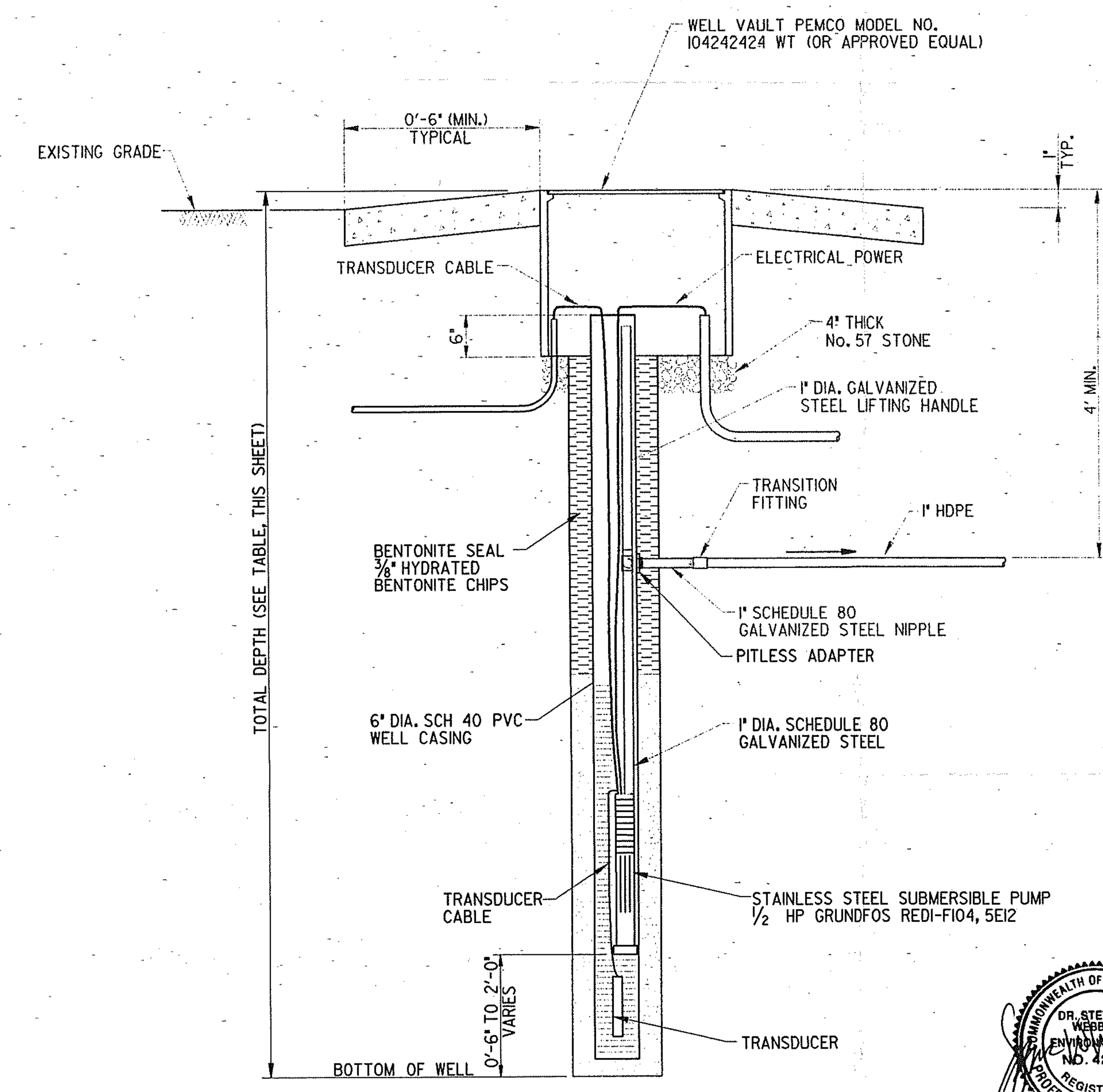
D / 5 **PAVEMENT PATCH DETAIL**
NOT TO SCALE



E / 5 **TYPICAL TRENCHING AND PIPE BEDDING DETAIL**
NOT TO SCALE



G / 5 **GROUNDWATER EXTRACTION WELL CONSTRUCTION DETAIL**
NOT TO SCALE



F / 5 **GROUNDWATER EXTRACTION WELL COMPLETION DETAIL**
NOT TO SCALE

GROUNDWATER EXTRACTION WELLS

WELL NUMBER	TOTAL DEPTH (FT)*	DEPTH OF PUMP FROM BOTTOM OF WELL (FT)	DEPTH OF TRANSDUCER FROM BOTTOM OF WELL (FT)
RW-01	18.11'	1.3'	1.0'
RW-02	26.09'	2.48'	1.0'
RW-03	18.95'	1.15'	1.15"
RW-04	15.84'	0.48'	0.48'
RW-05	11.88'	1.28'	1.28'
RW-06	18.85'	1.25'	1.25'
RW-07	17.50'	1.45'	1.45'

* NOTE: TOTAL DEPTH IS DEPTH FROM TOP OF CASING TO BOTTOM OF WELL

EXTRACTION WELLS RW-5 THROUGH RW-7 VFD IS LOCATED AT WELL HEAD.

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PROJECT: **MTD PRODUCTS COLUMBIA MANUFACTURING FACILITY WESTFIELD, MASSACHUSETTS**

SHEET TITLE: **MISCELLANEOUS DETAILS**

DRAWN BY: DMC	SCALE: AS NOTED	PROJ. NO. 998.73
CHECKED BY: SDS		FILE NO.
APPROVED BY: SWW	DATE PRINTED:	SHEET 5 OF 7
DATE: APRIL 2003		

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100 Verdae Blvd. Greenville, SC 29607-3825
P.O. Box 16778 29606-6778
Phone: 864-281-0030
Fax: 864-281-0288

COMMONWEALTH OF MASSACHUSETTS DR. STEVE W. WEBB III ENVIRONMENTAL No. 42732 REGISTERED PROFESSIONAL ENGINEER
5/30/03

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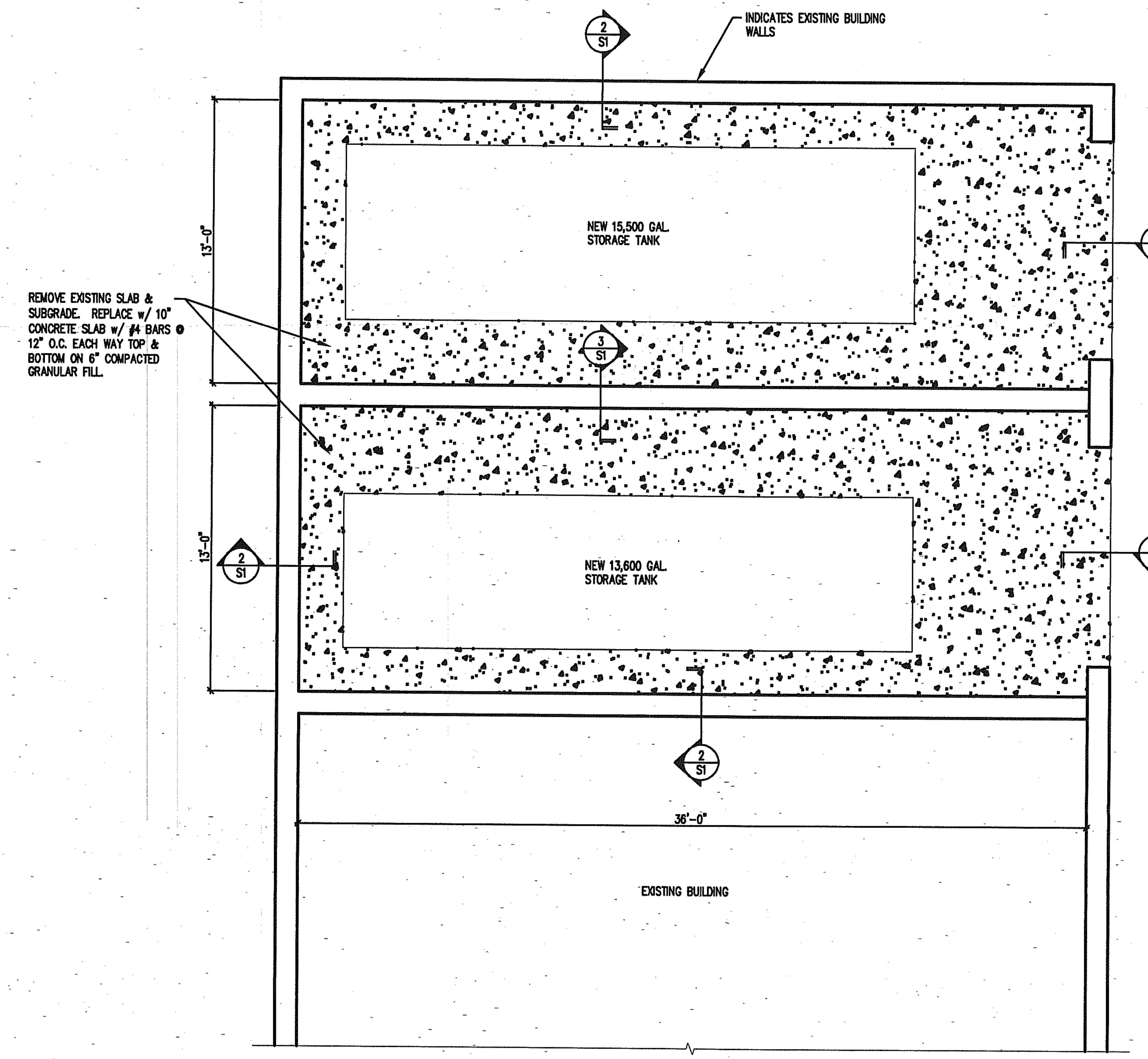


1 / S1 FOUNDATION PLAN @ STORAGE TANK BUILDING

SCALE: 1/4" = 1'-0"

DESIGN DATA

SOIL BEARING PRESSURE	p = 3000 psf
CONCRETE STRENGTHS	f'c = 4000 psi
REINFORCING STEEL: BARS (ASTM A 615, grade 60)	fy = 60,000 psi

STEEL TANK INFORMATION

THE DESIGN OF THE FOUNDATION SLAB WAS BASED ON THE FOLLOWING TANK INFORMATION. IF THE ACTUAL TANK INFORMATION IS OTHER THAN NOTED CONTACT ENGINEER FOR EVALUATION.

1. 15,500 GAL. TANK
   a. DIMENSIONS: 26'Lx8'Wx10'H
   b. SPECIFIC GRAVITY OF CONTENTS = 1.0
   c. TOTAL TANK WEIGHT = 15,000 lbs
   d. TANK CONTENTS WEIGHT = 130,000 lbs
2. 13,600 GAL. TANK
   a. DIMENSIONS: 26'Lx7'Wx10'H
   b. SPECIFIC GRAVITY OF CONTENTS = 1.0
   c. TOTAL TANK WEIGHT = 13,000 lbs
   d. TANK CONTENTS WEIGHT = 114,000 lbs

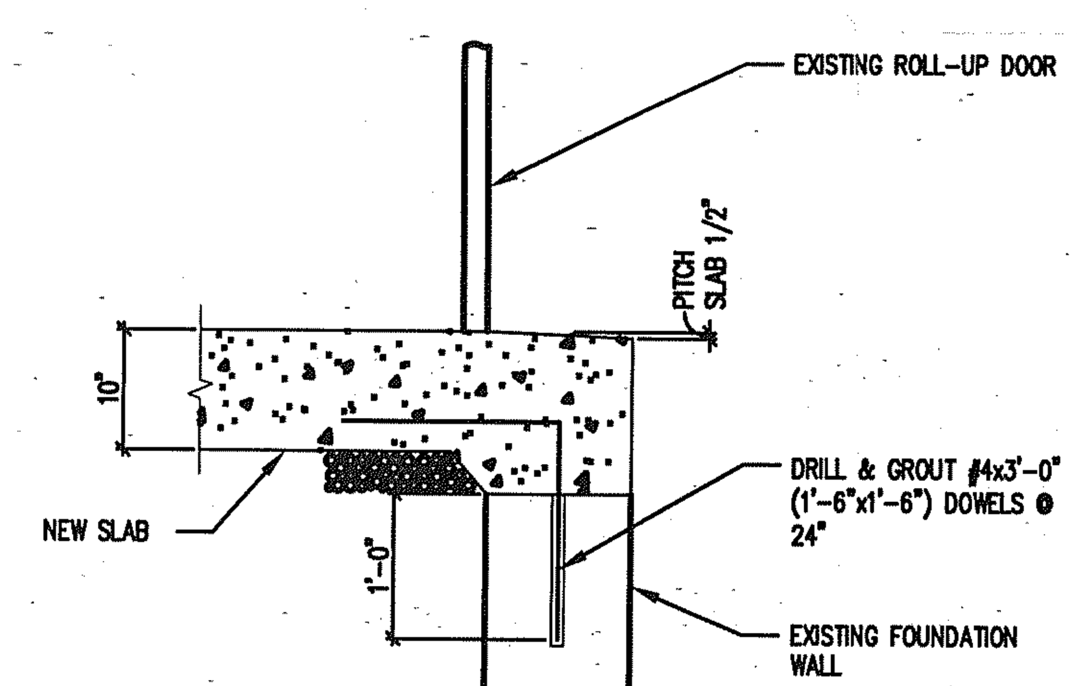
CONCRETE NOTES

1. READY-MIXED CONCRETE SHALL MEET THE REQUIREMENTS OF ASTM C94.
2. PORTLAND CEMENT PER ASTM C150 TYPE I OR II.
3. COARSE & FINE AGGREGATE PER ASTM C33.
4. WATER SHALL BE POTABLE
5. FLYASH PER ASTM C618 CLASS C
6. GROUND BLAST FURNALE SLAB PER ASTM C989, GRADE 120
7. OTHER ADMIXTURES AS APPROVED BY ENGINEER.
8. REINFORCING BARS PER ASTM A615, GRADE 60.
9. CONCRETE MIX DESIGN.

TYPE OF CONSTRUCTION	28 DAY STRENGHT psi	SLUMP (INCHES)	MAXIMUM AGGREGATE SIZE (INCH)	PERCENT OF AIR ENTRAINING	MAXIMUM WATER/CEMENT RATIO
SLAB	4000	4	1\"	0	0.45

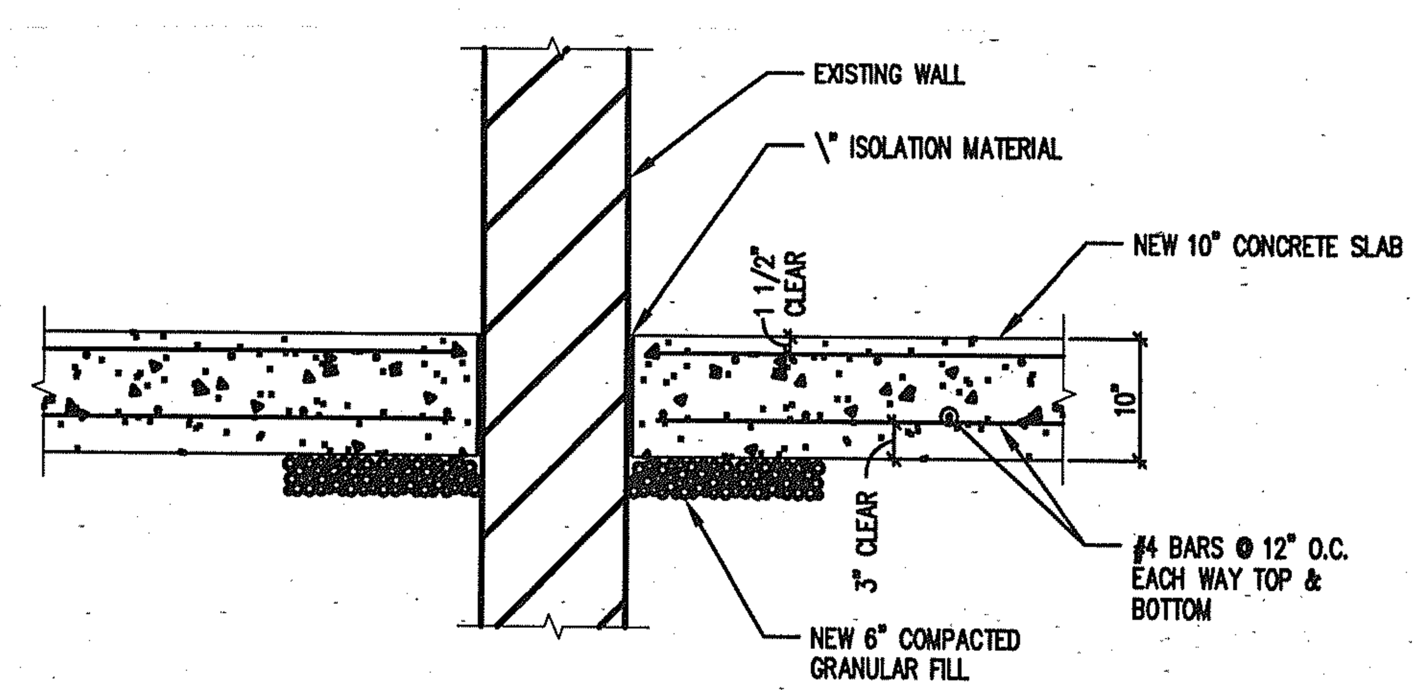
FLYASH OR SLAG MAY BE SUBSTITUTED ON POUND FOR POUND BASIS WITH A MINIMUM AMOUNT OF SLAB OR FLYASH BEING 25 PERCENT OF THE TOTAL WEIGHT OF SLAG AND/OR FLYASH AND PORTLAND CEMENT.

NOTE: FIELD VERIFY EXISTING CONDITIONS AS REQUIRED FOR DEMOLITION AND NEW WORK. REPORT DISCREPENCIES FROM WHAT IS NOTED ON THE DRAWINGS TO ACTUAL FIELD CONDITIONS TO ENGINEER FOR EVALUATION.



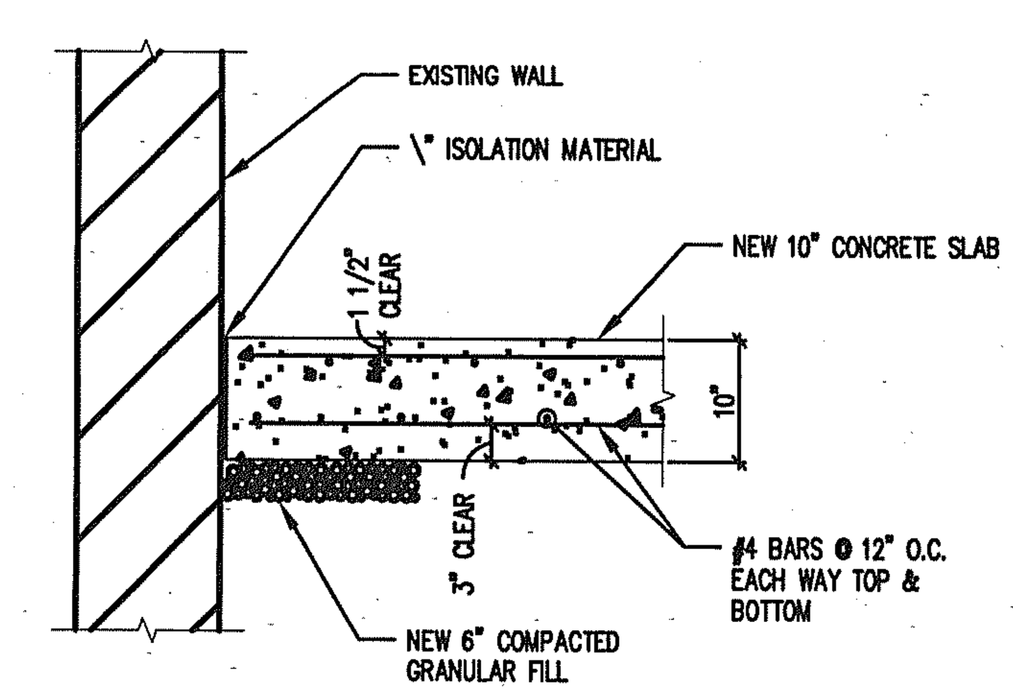
4 / S1 SECTION @ ROLL-UP DOOR

SCALE: NTS



3 / S1 SECTION @ BLDG. DEMISING WALL

SCALE: NTS



2 / S1 SECTION @ BLDG. WALL

SCALE: NTS

PIERCE ENGINEERS, Inc.
210 North Bassett St., Suite 110
Madison, WI 53703
(608) 256-7304
(608) 256-7306 fax
PE PROJECT M02135

NO.	BY	DATE	REVISION	APP'D.
B	DMC	8-9-02	ISSUED FOR AGENCY REVIEW	SDS
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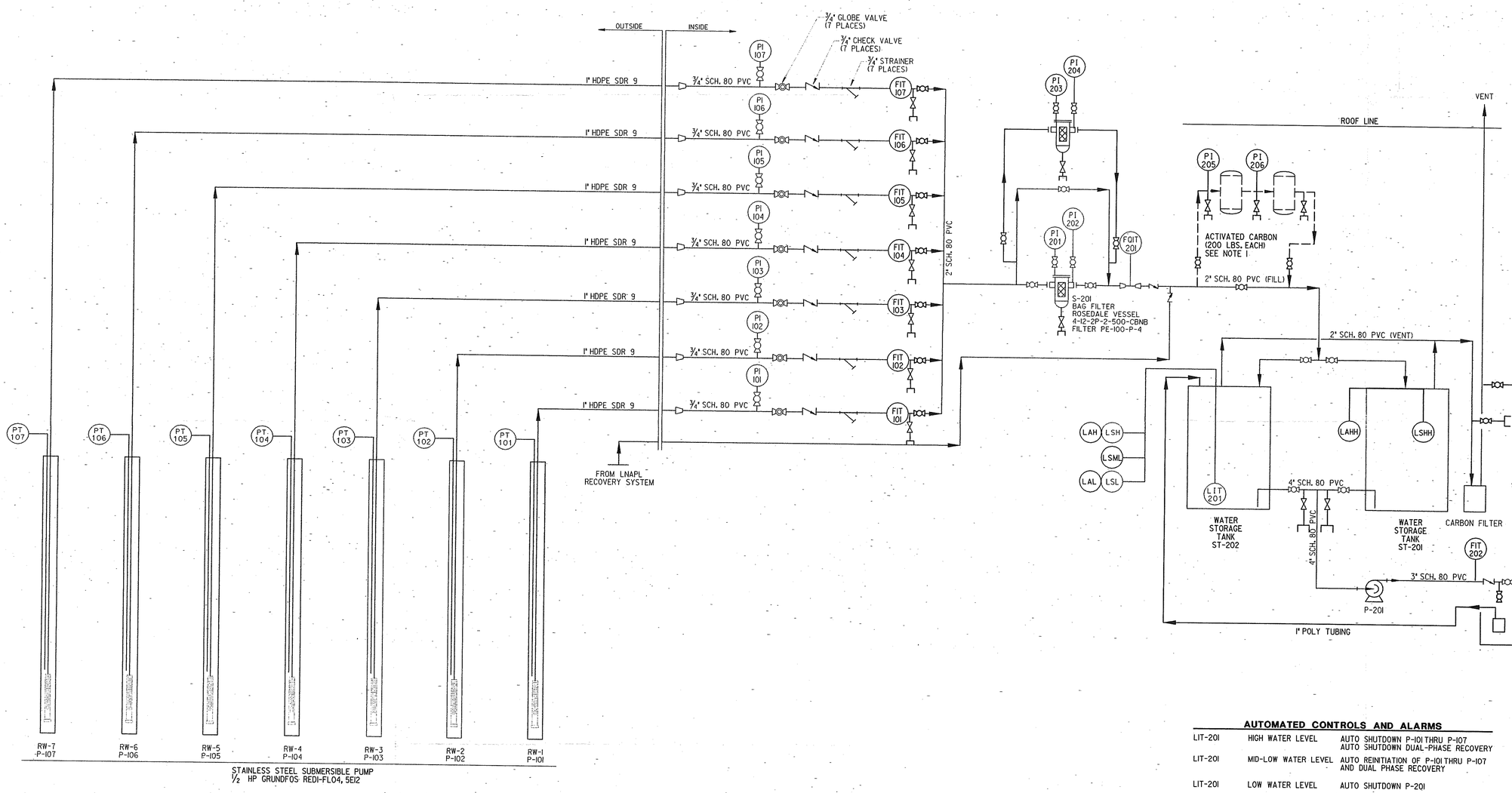
MTD PRODUCTS
COLUMBIA MANUFACTURING FACILITY
WESTFIELD, MASSACHUSETTS

SHEET TITLE: **FOUNDATION PLAN & DETAILS**

DRAWN BY: PE	SCALE: AS NOTED	PROJ. NO. 998.73
CHECKED BY:		FILE NO.
APPROVED BY:	DATE PRINTED:	SHEET 6 OF 7
DATE: JULY 2002		

RMT INC.
100 Verdae Blvd.
Greenville, SC 29607-3825
P.O. Box 16778 29606-6778
Phone: 864-281-0030
Fax: 864-281-0288



LEGEND

- GLOBE VALVE
- BALL VALVE
- CHECK VALVE
- PI — PRESSURE INDICATOR
- FIT — FLOW INDICATOR-TOTALIZER
- FQIT — FLOW RATE INDICATOR-TOTALIZER
- LIT — LEVEL INDICATOR-TRANSMITTER
- LSL — LEVEL SWITCH LOW
- LSH — LEVEL SWITCH HIGH
- LAH — LEVEL ALARM HIGH
- LAL — LEVEL ALARM LOW
- LSML — LEVEL SWITCH MID-LOW
- FLEXIBLE CONNECTION
- CENTRIFUGAL PUMP
- SUBMERSIBLE PUMP
- SAMPLE TAP
- BUCKET WITH SUMP PUMP

NOTES

1. ACTIVATED CARBON TREATMENT UNITS PROVIDED AT INITIAL SYSTEM OPERATION. MAY BE REMOVED IN FUTURE.

AUTOMATED CONTROLS AND ALARMS

LIT-201	HIGH WATER LEVEL	AUTO SHUTDOWN P-101 THRU P-107 AUTO SHUTDOWN DUAL-PHASE RECOVERY
LIT-201	MID-LOW WATER LEVEL	AUTO REINITIATION OF P-101 THRU P-107 AND DUAL PHASE RECOVERY
LIT-201	LOW WATER LEVEL	AUTO SHUTDOWN P-201
LSHH	HI-HI WATER LEVEL	BACKUP FOR LIT-201 AUTO SHUTDOWN
FIT-202	TOTAL GALLONS	AUTO SHUTDOWN P-201

NOTE: CONTROLS DETAILS TO BE PROVIDED IN ELECTRICAL DRAWING AND CONTROLS PACKAGE.

COMMONWEALTH OF MASSACHUSETTS
DR. STEVE W. WEBB III
ENVIRONMENTAL ENGINEER
NO. 42732
REGISTERED PROFESSIONAL ENGINEER
5/30/03

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PROJECT:
MTD PRODUCTS
COLUMBIA MANUFACTURING FACILITY
WESTFIELD, MASSACHUSETTS

SHEET TITLE:
GROUNDWATER RECOVERY SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM

DRAWN BY: DMC	SCALE:	PROJ. NO.	998.73
CHECKED BY: SDS	AS NOTED	FILE NO.	
APPROVED BY: SWW	DATE PRINTED:	SHEET	7 OF 7
DATE: APRIL 2003			

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RMT
100 Verdae Blvd.
Greenville, SC 29607-3825
P.O. Box 16778 29606-6778
Phone: 864-281-0030
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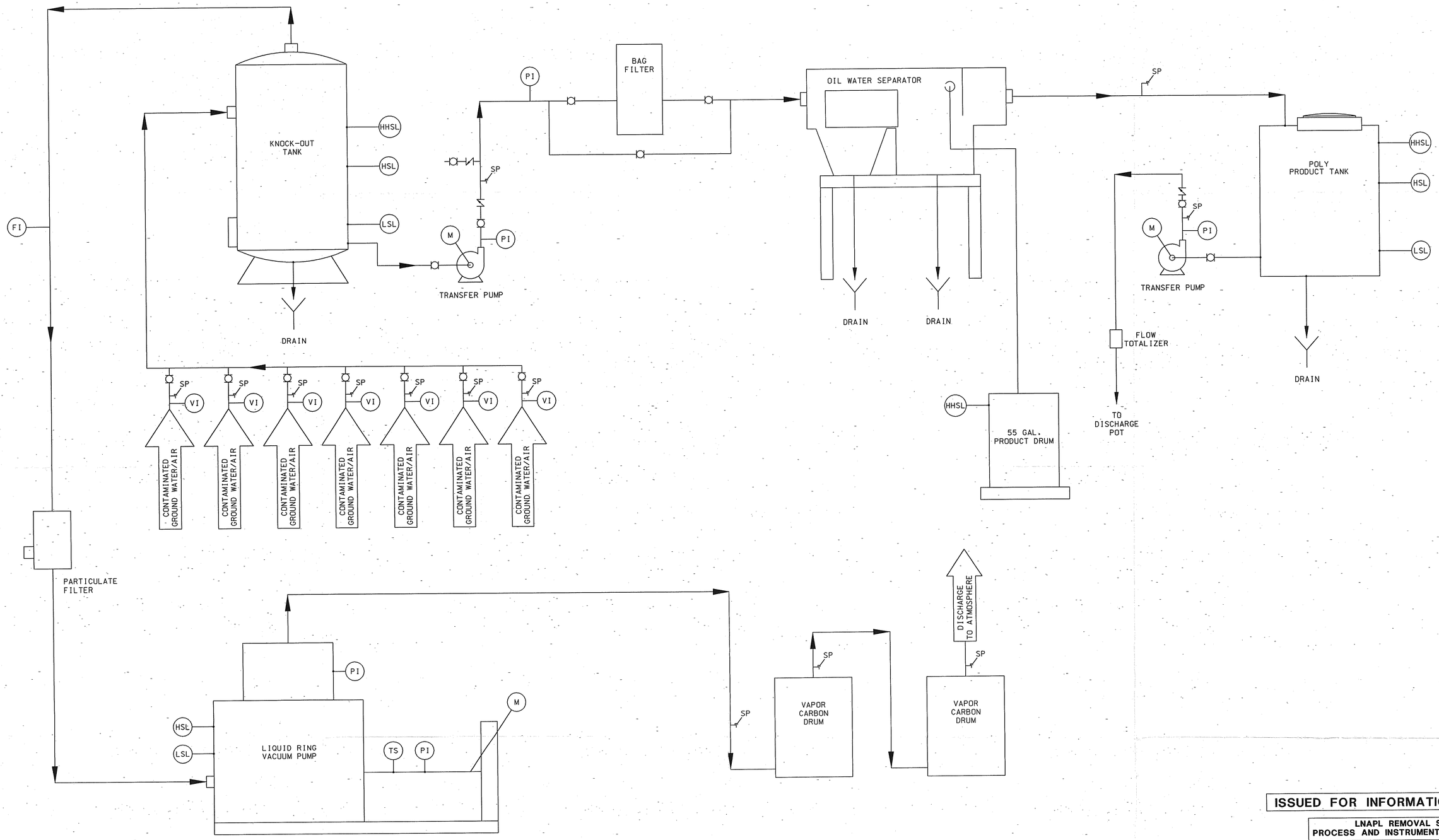


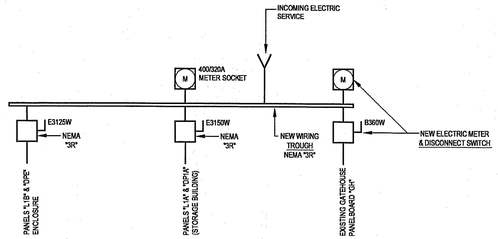
ISSUED FOR INFORMATION ONLY

LNAPL REMOVAL SYSTEM
PROCESS AND INSTRUMENTATION DIAGRAM

SCHRADER ENVIRONMENTAL SERVICES, INC.
9941 EAST M-21
OVID, MI 48866
PH. (989) 834-1400

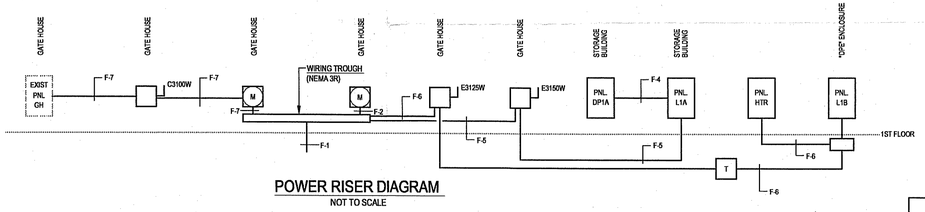
CUSTOMER INFORMATION		DRAWING INFORMATION		
PURCHASER		P.M.	E.M.	DATE:
		SCALE	CAD SET-UP	
P.O.NO.	SHEET OF	DRAWN	DATE	
CUSTOMER		DRAWING NUMBER		REVISION

NOT FOR CONSTRUCTION



POWER ONE-LINE DIAGRAM

NOT TO SCALE



POWER RISER DIAGRAM

NOT TO SCALE

FEEDER SCHEDULE

DESIGNATION	SIZE	GND	CONDUIT SIZE	QUANTITY	BREAKER SIZE AMPS	BREAKER POLE
F-1	4#600kcmil	# 3	3 1/2"	1	-	-
F-2	4#350kcmil	# 3	3 1/2"	1	-	-
F-3	NOT USED					
F-4	3#3	# 10	3/4"	1	100	3
F-5	4#1/0	# 6	2"	1	150	3
F-6	4#1	# 8	1 1/2"	1	125	3
F-7	3#3	# 8	1 1/4"	1	100	2

PANEL SCHEDULE

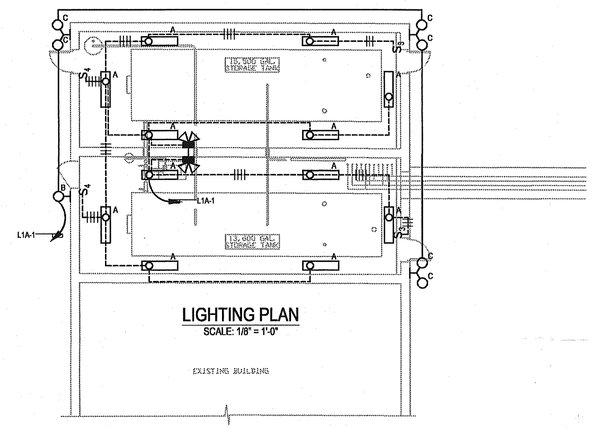
CIRCUIT NUMBER	BREAKERS AMPS	BREAKERS POLES	BREAKERS AIC	EQUIPMENT SERVED
PANEL "DP1A" 120/208 VOLT, 3Ø, 4 W, 100 AMPERE MAIN LUGS. SURFACE MOUNTED				
		SEE NOTE #5		
PANEL "L1A" 120/208 VOLT, 3Ø, 4 W, 125 AMPERE MAIN LUGS. SURFACE MOUNTED				
1,2,7	20	1	22,000	LIGHTING AND RECEPTACLES
3	100	3	22,000	PANEL "DP1A"
4,5	20	3	22,000	UNIT HEATERS
6	100	3	22,000	EXISTING PANEL "GH"
8, 9	20	1	22,000	EXHAUST FANS
10-16	20	1	22,000	SPARES
PANEL "HTR" 240 VOLT, 3Ø, 3 W, 100 AMPERE MAIN LUGS ONLY. SURFACE MOUNTED				
1-6	20	2	10,000	ELECTRIC HEAT TRACE CABLE

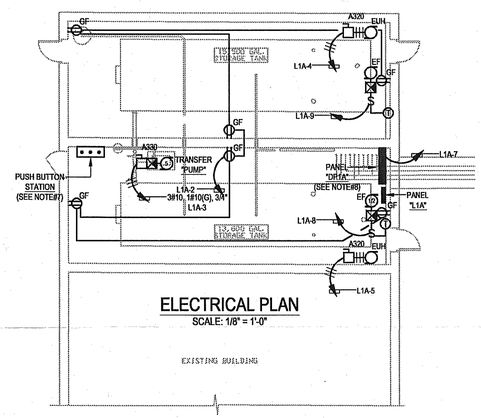
LIGHTING FIXTURE SCHEDULE

TYPE	MANUFACTURER	MOUNTING	LAMPS WATTS	LAMPS TYPE	FINISH	LOCATION	REMARKS
A	HUBBELL EWL042R-SPDR-E1-120V	PENDANT	4 32W	F32T8 TL835	GRAY	STORAGE BUILDING	SEE NOTE#10
B	HUBBELL NRG-305-PC-HPF	WALL	50W	METAL HALIDE	BRONZONIC	STORAGE BUILDING	
C	STONCO M3303WH-HT	WALL	2 150W	PAR 38	WHITE	STORAGE BUILDING	

CONDUIT AND WIRE SCHEDULE

TRENCH SECTION	DESCRIPTION	SIZE (INCHES)	WIRING
A-1	MAIN: STORAGE TANK BUILDING TO DPVE AND RW-1	1.5	(6)#10, (6)#6, (1)#10 GRD
		1.5	(6)#6, (3)#8, (1)#8 GRD
		1.5*	(4) TRANSDUCER CABLE (TBD) 2-8 COND. DATA
		1.5	(1) 8 COND. DATA
A-2	MAIN TO DPVE	4	(4)#1, (1)#6 GRD
		1	(2)#12
A-3	MAIN TO RW-1	0.75	(3)#10, (1)#10 GRD
		0.75*	(1) TRANSDUCER CABLE (TBD)
B-1	MAIN: RW-1 TO RW-2	1.5	(3)#10, (1)#8 GRD
		1.5	(6)#6, (3)#8, (1)#8 GRD
		1.5*	(3) TRANSDUCER CABLE (TBD) 2-8 COND. DATA
		1.5	(1) 8 COND. DATA
B-2	MAIN TO SPARE #1	0.75	FUTURE
		0.75*	(1) TRANSDUCER CABLE (TBD)
B-3	MAIN TO RW-2	0.75	(3)#10, (1)#10 GRD
		0.75*	(1) TRANSDUCER CABLE (TBD)
C-1	MAIN: RW-2 TO RW-3	1.5	(6)#8, (1)#8 GRD
		1.5	(6)#6, (3)#8, (1)#8 GRD
		1.5*	(2) TRANSDUCER CABLE (TBD) 2-8 COND. DATA
		1.5	(1) 8 COND. DATA
C-2	MAIN TO SPARE #2 (OW-03)	0.75	FUTURE
		0.75*	(1) TRANSDUCER CABLE (TBD)
C-3	MAIN TO RW-3	0.75	(3)#8, (1)#10 GRD
		0.75*	(1) TRANSDUCER CABLE (TBD)
D-1	MAIN: RW-3 TO RW-4	1.5	(3)#8, (1)#8 GRD
		1.5	(6)#6, (3)#8, (1)#8 GRD
		1.5*	(1) TRANSDUCER CABLE (TBD) 2-8 COND. DATA
		1.5	(1) 8 COND. DATA
D-2	MAIN TO SPARE #3	0.75	FUTURE
		0.75*	(1) TRANSDUCER CABLE (TBD)
D-3	MAIN TO RW-4	0.75	(3)#8, (1)#8 GRD
		0.75*	(1) TRANSDUCER CABLE (TBD)
E-1	MAIN: RW-4 TO RW-5	1.5	(6)#6, (3)#8, (1)#8 GRD
		1.5*	(3) CABLE (TBD) 8 COND. DATA
		1.5	SPARE
E-2	MAIN TO RW-5	0.75	(3)#8, (1)#8 GRD
		0.75*	(1) TRANSDUCER CABLE (TBD)
F-1	MAIN: RW-5 TO RW-6	1.5	(6)#6, (1)#8 GRD
		1.5*	(3) CABLE (TBD) 8 COND. DATA
		1.5	SPARE
F-2	MAIN TO RW-6	0.75	(3)#6, (1)#8 GRD
		0.75*	(1) TRANSDUCER CABLE (TBD)
G-1	MAIN: RW-6 TO RW-7	1.5	(3)#6, (1)#8 GRD
		1.5*	(1)
		-	8 COND. DATA
NOTES:	*MIN. 1-FOOT SEPARATION BETWEEN CONDUITS WITH TRANSDUCER CABLE(S) AND THOSE WITH HIGH VOLTAGE WIRING		





NOTES:

1. THE ELECTRICAL CONTRACTOR SHALL INSTALL THE GATEHOUSE ELECTRIC SERVICE UNDERGROUND BETWEEN UTILITY POLE AND GATEHOUSE. SEE SHEET SE-1.00.
2. THE ELECTRICAL CONTRACTOR SHALL DISCONNECT AND REMOVE THE EXISTING GATEHOUSE ELECTRIC SERVICE AND INSTALL A NEW ELECTRIC SERVICE AS INDICATED ON THE DRAWINGS.
3. PANEL "DP1A" SHALL BE FURNISHED BY BISCO ENVIRONMENTAL, INSTALLED AND WIRED BY THE ELECTRICAL CONTRACTOR.
4. ELECTRIC UNIT HEATER SHALL BE MODEL MUH05-81-206-3MT-2MCMB-10 CEILING MOUNTING BRACKET.
5. ELECTRICAL CONTRACTOR SHALL REFER TO THE BISCO DOCUMENTS SHEETS 1 THRU 9 FOR THE SPECIFIC PANEL REQUIREMENTS AND ASSOCIATED BRANCH CIRCUIT WIRING REQUIREMENTS.
6. PANELBOARD "DP1A" SHALL BE A NEMA "3R" AND SHALL BE INSTALLED AT THE GUARD HOUSE EXTERIOR.
7. ELECTRICAL CONTRACTOR SHALL REFER TO BISCO ENVIRONMENTAL DRAWING SHEET 8 OF 9 FOR PUSH-BUTTON STATION REQUIREMENTS. FINAL LOCATION TO BE DETERMINED BY THE ENGINEER IN THE FIELD.
8. ELECTRICAL CONTRACTOR SHALL REFER TO BISCO ENVIRONMENTAL DRAWING SHEET 7 OF 9 FOR CONTROL PANEL REQUIREMENTS. FINAL LOCATION TO BE DETERMINED BY THE ENGINEER IN THE FIELD.
9. THE FINAL LOCATION OF PANELS "L1A" AND "DP1A" SHALL BE VERIFIED BY THE ELECTRICAL CONTRACTOR AND ENGINEER IN THE FIELD.
10. EXACT LENGTH OF PENDANT FOR THE TYPE "A" LUMINAIRE SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER.
11. ELECTRICAL CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF EXHAUST FANS AND THERMOSTATS.
12. PANEL "L1B" LOCATED IN "DPE" ENCLOSURE BUILDING SHALL BE FURNISHED AND INSTALLED BY THE TEMPORARY BUILDING CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL WIRE AS INDICATED ON THE PLANS.
13. BUILDING EXHAUST FAN BRANCH CIRCUIT WIRING IS BASED ON 1/2 HP. OR LESS AT 120 VOLTS. EXACT HORSEPOWER TO BE DETERMINED BY OTHERS.

LEGEND

- HH — ELECTRIC HANDHOLE.
- 1 — MOTOR (NUMERAL DENOTES HORSEPOWER).
- A325W — DISCONNECT SWITCH. ALPHA/NUMERIC CHARACTERS DENOTE SWITCH DESIGNATION, POLES, AMPERE RATING OF FUSE. "W" DENOTES WEATHERPROOF SWITCH. (SEE DISCONNECT SWITCH SCHEDULE ON THIS SHEET).
- DIRECT ELECTRICAL CONNECTION. ELECTRICAL CONTRACTOR TO PERMANENTLY CONNECT EQUIPMENT READY FOR OPERATION.
- POWER DISTRIBUTION PANELBOARD (SURFACE MOUNTED 6'-6" TO TOP).
- LIGHTING PANELBOARD (SURFACE MOUNTED). MOUNTED 6'-6" TO TOP.
- 100A-3P / 20A — CIRCUIT BREAKER. NUMERALS DENOTE THE FRAME SIZE, POLES AND TRIP RATING.
- 100A-3P / 20A — FUTURE. CIRCUIT BREAKER. NUMERALS DENOTE THE FRAME, POLES AND TRIP RATING.
- VSD — VARIABLE SPEED DRIVE
- M — ELECTRIC METER.
- T — THERMOSTAT
- A — FLUORESCENT LIGHTING FIXTURE. "A" DENOTES LIGHTING FIXTURE TYPE. SUBSCRIPT "b" DENOTES SWITCH CONTROL LIGHTING FIXTURE. NUMERAL DENOTES CIRCUIT NUMBERS. (TYPICAL ALL LIGHTING FIXTURES).
- WALL MOUNTED LIGHTING FIXTURE.
- EMERGENCY BATTERY WITH LIGHTING FIXTURES EMERGILITE MODEL ECM18-2-EF23(ZD).
- S — SINGLE POLE SWITCH MOUNTED 4'-0" A.F.F.
- GF — GROUND FAULT RECEPTACLE MOUNTED 4'-0" A.F.F.
- MAGNETIC STARTER (NUMERAL DENOTES SIZE).
- EUH — ELECTRIC UNIT HEATER.
- HOMERUN. ARROWS DENOTES THE NUMBER OF CIRCUITS AND SLASH MARKS DENOTE THE NUMBER OF #12 CONDUCTORS IN RACEWAY OR CABLE ASSEMBLY.
- PLC — PROGRAMABLE LOGIC CONTROLLER.
- STOP-START PUSH BUTTON STATION
- MAGNETIC MOTOR STARTER WITH TWO(2) AUXILLIARY CONTACTS.

DISCONNECT SWITCH SCHEDULE

DESIGNATION	SWITCH AMPERE RATING	DESIGNATION	SWITCH AMPERE RATING
A	30A	J	1200A
B	60A	K	1600A
C	100A	L	2000A
D	200A	M	2500A
E	400A	N	3000A
F	600A	P	4000A
G	800A		
H	1000A		

AS BUILT DOCUMENTS
06-26-03

ENVIRONMENTAL COMPLIANCE SERVICES, INC.
588 Silver Street * Agawam, MA 01001
Brighton, MA * Brattleboro, VT * Tampa, FL * Madison CT

PROJECT:
Columbia Manufacturing Facility

Westfield, Massachusetts

TITLE:
RISER DIAGRAMS & SCHEDULES

CLIENT:
MTD Products

GRAPHIC SCALE:

AUTOCAD FILE:

DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
DG, JD	-	FPG	FPG
SCALE	DATE	JOB NO.	SHEET NO.
AS SHOWN	06-10-03	14667	E-3.00

COMMONWEALTH OF MASSACHUSETTS — FREDERICK P. GOFF — ELECTRICAL — No. 37410 — REGISTERED PROFESSIONAL ENGINEER

NOTES:

1. ELECTRICAL CONTRACTOR SHALL REMOVE EXISTING GATEHOUSE ELECTRIC SERVICE AND INSTALL A NEW ELECTRIC SERVICE AS INDICATED ON SHEET E-3.00.
2. BRANCH CIRCUIT WIRING TO RECOVERY WELLS SHALL BE THRU EXISTING CONDUIT SYSTEM INSTALL BY THE ELECTRICAL CONTRACTOR.
3. ELECTRICAL CONTRACTOR SHALL VERIFY WITH WESTFIELD GAS & ELECTRIC EXACT POINT OF ELECTRIC SERVICE.
4. ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL A BELDEN # E106553,U.L. TYPE CM, 18 GAUGE 2 CONDUCTOR WITH SHIELD CABLE FROM EACH RECOVERY WELL TO PANEL "DP1A" LOCATED IN THE STORAGE BUILDING.
5. THE ELECTRICAL CONTRACTOR SHALL PROVIDE A SERVICE GROUNDING ELECTRODE AT THE TEMPORARY BUILDING, STORAGE BUILDING AND GATE HOUSE.
6. THE ELECTRICAL CONTRACTOR SHALL VERIFY WITH THE LOCAL WIRING INSPECTOR THAT LOCKABLE CIRCUIT BREAKERS AT PANEL "DP1A" WILL BE AN ACCEPTABLE MEANS FOR POWER DISCONNECTS FOR RECOVERY WELL MOTORS. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL A PERMENTALLY ENGRAVED PLACARD AT EACH RECOVERY WELL IDENTIFYING THE LOCKABLE CIRCUIT BREAKER LOCATION AND CIRCUIT NUMBER BEFORE PERFORMING ANY ELECTRICAL OPERATION AT THE RECOVERY WELL LOCATION.
7. EQUIPMENT WAS FURNISHED WITH BUCKBOOST TRANSFORMER.
8. EQUIPMENT WAS FURNISHED WITH THREE PHASE TRANSFORMER.
9. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL A NEW OVERHEAD PHONE LINE TO THE STORAGE BUILDING.
10. PULL BOXES ARE 17" X 30" X 13"D EACH PULL BOX CONTAINS TWO(2) 12"X 12" X 6"D JUNCTION BOXES.
11. THE ELECTRICAL CONTRACTOR SHALL REFER TO THE CONDUIT AND WIRE SCHEDULE INDICATED ON SHEET E-3.00.
12. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL NEW BUCK BOOST TRANSFORMERS.
13. ALL HOMERUNS TO PANELBOARDS ARE INSTALLED THROUGH THE NEAREST PULL BOX.

SITE ELECTRICAL PLAN

SCALE: 1"=50'-0"

NOTES:

1. RISER PIPES SHALL BE LOCATED ON A STREET QUARTER OF POLE AND WHEN POSSIBLE ON THE QUARTER AWAY FROM APPROACHING TRAFFIC.

UTILITY POLE STANDPIPE DETAIL

NOT TO SCALE

AS BUILT DOCUMENTS
06-26-03

ENVIRONMENTAL COMPLIANCE SERVICES, INC.
588 Silver Street * Agawam, MA 01001
Brighton, MA * Brattleboro, VT * Tampa, FL * Madison CT

PROJECT:	Columbia Manufacturing Facility Westfield, Massachusetts
TITLE:	SITE ELECTRICAL PLAN
CLIENT:	MTD Products
GRAPHIC SCALE:	
AUTOCAD FILE:	

DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
JG, JD	-	FPG	FPG
SCALE	DATE	JOB NO.	SHEET NO.
AS SHOWN	06-10-03	14667	SE-1.00

COMMONWEALTH OF MASSACHUSETTS — FREDERICK P. GOFF ELECTRICAL No. 33416 — REGISTERED PROFESSIONAL ENGINEER

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Appendix B
Monitoring Forms

Close File

SYSTEM STATUS SHEET

Columbia Manufacturing
Westfield, MA

Date:
Personnel:

Perimeter Groundwater System

Alarm Conditions

Storage Tank High High		Storage Tank High Level		Storage Tank Low Level		DPE Fault	

Control Panel Settings

P-101	on	off auto
P-102	on	off auto
P-103	on	off auto
P-104	on	off auto
P-105	on	off auto
P-106	on	off auto
P-107	on	off auto
Trans. Pump	on	off auto

Well ID	PI	Pressure	FQIT Flow meter		FQIT Flow rate	
RW-1	**101**	psi	**101**	gals	**101**	gpm
RW-2	**102**	psi	**102**	gals	**102**	gpm
RW-3	**103**	psi	**103**	gals	**103**	gpm
RW-4	**104**	psi	**104**	gals	**104**	gpm
RW-5	**105**	psi	**105**	gals	**105**	gpm
RW-6	**106**	psi	**106**	gals	**106**	gpm
RW-7	**107**	psi	**107**	gals	**107**	gpm

Bag Filter

Pressure 1	psi	**PI201**
Pressure 2	psi	**PI202**

Change Out Filter **OB02**
1=Yes **2**=No

Post-change Filter Pressure			
1	psi	**PI101**
2	psi	**PI102**

LPGAC ME10	Influent psi		
ME11	Mid point psi		

Tank Feed Lines

Tank 1 ball valve	open	closed
Tank 2 ball valve	open	closed

Totalizing Flow Meter **FQIT201** _____ gals **Flow rate:** _____ gpm **FQIT201**

Storage Tank Level _____ **ME01**

Discharge Flow Meter **FQIT202** _____ gals

OB05 GAC cartridge #1 1=Yes 2= No
OB06 GAC cartridge #2 1=Yes 2= No

Comments:

SYSTEM STATUS SHEET

Columbia Manufacturing
Westfield, MA

DPE System

Date:
Personal:

Alarm Conditions

Liquid Ring High Temp	Liquid Ring Oil Level	A / W Separator High Level
Transfer Tank High Level	Product Tank High Level	

Control Panel Settings

Liquid Ring	A / W Separator	Transfer Tank
hand off auto	hand off auto	hand off auto

Liquid Ring Pump

vacuum	**ME09**	inch Hg
temp.	**ME08**	deg F
exhaust temp.	**ME12**	deg F
oil level		
air flow	**ME02**	cfm

A / W Transfer pump — **ME03** psi
O / W Transfer pump — **ME04** psi

Oil / Water Separator Observations: _____

Bag Filter

pressure 1	**ME13**	psi
pressure 2	**ME14**	psi

change out filter **OB01**
1=Yes **2**=No

after change filter pressure

1	psi	**ME13**
2	psi	**ME14**

Flow Meter — **ME07** gals. — rate: **ME07** gpm

Air to Air Heat Exchanger

operating	yes no	
drained condensate	yes no	gals.

VPGAC

		psi	voc
Influent	**ME15**		
mid point	**ME16**		
effluent		na	

OB03 GAC cartridge #1 1=Yes 2= No
OB04 GAC cartridge #2 1=Yes 2= No

DPE Lines	vacuum		water present in extraction line
RW-1	**DPE01**	inch Hg	slurping steady absent
RW-2	**DPE02**	inch Hg	slurping steady absent
RW-3	**DPE03**	inch Hg	slurping steady absent
RW-4	**DPE04**	inch Hg	slurping steady absent
RW-5	**DPE05**	inch Hg	slurping steady absent
RW-6	**DPE06**	inch Hg	slurping steady absent
RW-7	**DPE07**	inch Hg	slurping steady absent

comments: _____

Appendix C
Industrial Discharge Permit

City of Westfield WPCP
Industrial Discharge Permit

Date Issued 01-09-03
Permit No. 0100

Pollutant Standard Limits for Industrial Users Classified as MTD Products Inc. 40CFR Part 433 Existing Sources:

Parameter	Daily Limits	Monitoring Requirement
Total Suspended Solids	10 mg/l	Monthly Grab
Organics (TTO)	2.13 mg/L	Monthly Grab
Copper	4 mg/l	Monthly Grab
Chromium	4mg/l	Monthly Grab
Cadmium	2 mg/l	Monthly Grab
Nickel	6 mg/l	Monthly Grab
Aluminum	0.9 mg/l	Monthly Grab
Manganese	10 mg/l	Monthly Grab
Mercury	0.2 mg/l	Monthly Grab
Silver	2 mg/l	Monthly Grab
Lead	2 mg/l	Monthly Grab
Zinc	10 mg/l	Monthly Grab
Cyanide	2 mg/l	Monthly Grab
Flow	30,000 gpd	Daily
pH	Between 5.5 & 9.5 Std. Units	Per Load

Grab samples will be taken from each load brought into the WPCP for discharge and will be tested for pH by the City Staff.

Once a month at the City's discretion, a grab sample will be taken and analyzed for the above parameters, at an approved outside laboratory. All testing cost will be the Permittee's responsibility.

Copies of the COC and all testing results of all samplers taken will be supplied to the Permittee and the City of Westfield WPCP for their records.

Superintendent of WPCP